UNIV. OF MICH.
JUN 10 1924

The ELECTRICAL REVIEW

FOUNDED 1872

VOL. XCIV. No. 2427. | MAY 30, 1924. | PRICE SIXPENCE.

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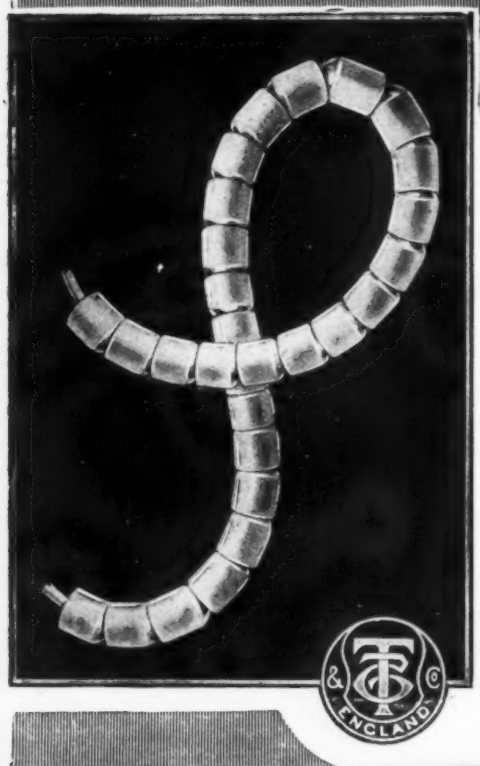

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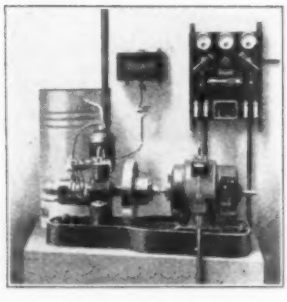

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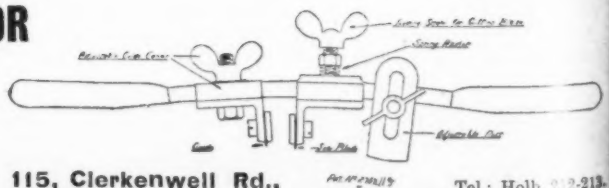

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The

Electrical Review

VOL. XCIV. MAY 30, 1924. No. 2,427.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E. A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT., LONDON," Code, A B C. Telephone Nos.: Central 8260 and 8261.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

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An Export Trade Inquiry.

IT is probable that before these lines appear in print the Government will have announced the setting up of a Committee, and its terms of reference, to hold an inquiry with regard to the present position of British export trade and its prospects for the future.

A resolution moved in the House of Commons was withdrawn, after debate, in deference to a promise from the President of the Board of Trade that very soon—"the next day or later"—a statement bearing upon the form of inquiry and the *personnel* of the Committee would be made.

In a subsequent written reply to a question, it was stated on behalf of the Prime Minister that the Government felt that an inquiry "sufficiently limited in its scope to be definite in its results, and yet sufficiently wide to be really enlightening," ought to be held. A hope was further expressed that the terms of reference would "shortly" be announced.

We must be thankful when Mr. Sidney Webb, as President, declares that this present Government is "not unsympathetic" (why not a definite positive instead of this half-hearted double negative?) toward the demand for an inquiry; and perhaps more grateful for his assurance that there is no question of making the matter a "party" one, as all "parties" will be invited to consult together regarding the area to be covered and the *personnel* of the investigating body. Note further the reluctance: The Government is *obliged to take notice* of the fact that an inquiry is being pressed for in many quarters—by manufacturers and by Chambers of Commerce. If we were able to overlook that reluctance we might find it easier to accept his assurance that the Government is as much concerned as anyone about the development of the overseas trade. How deep is that concern is not apparent when we find him saying that the whole object of our export trade is to get imports! Nor does it convince us that a practical grasp of the situation is yet secured by the president when he remarks that our country has flourished in the past *when other countries have taken our trade and our manufactures* (? *manufacturing*), and that it will continue so to flourish in the future when that happens. How far British industries would be likely to prosper by unrestricted importation of manufactured goods or by our taking reparations in kind, or by permitting Teutonic concerns to erect super-power stations with Continental equipment, has already been made plain by those great trade organisations and other

bodies of which the Government is "obliged" to take notice. In these days it is easier by far to be a buyer of foreign goods than an export seller of British manufactures at a profitable price.

Mr. Webb did not only speak in the House of Commons. He delivered his soul also at Northampton, and among other remarks uttered there was one to the effect that the people who were interested in steel, cotton, or coal could not believe that anything else was worth talking about. This is little short of utter nonsense. There is no disposition either in organisations or in publicly expressed trade opinion, so far as we are aware, to have less regard for the "thousand and one occupations" which all contribute their little bit toward our general prosperity, but if we can secure prosperity in the steel, textile, and coal trades, which employ many millions of employés of all classes, such a happy state of affairs would go far to increase the purchasing power of the public so that those thousand and one occupations would automatically benefit therefrom. The engineering trade is a great home internal trade as well as an export one, and if one section of it is to be "assisted" along recently discussed lines which will, according to those connected with it, cause additional unemployment, then the "assistance" will be of the kind that comes from our "flourishing" as other countries take our trade away. Mr. Webb is reported to have said that it was the business of the Board of Trade to "facilitate every trade in carrying on its own business" which may or may not be consistent with a policy of withdrawing facilities which were granted for the security of hampered sections.

Several of our legislators have dwelt upon the importance of obtaining new markets and the need for that subject to be embraced in the terms of reference for the proposed inquiry. But here there inevitably arise such points as the cost of production, the difference between wages in "sheltered" and unsheltered trades, and the increasing difficulties that face us in some of our established markets, as well as the practical impossibility of dealing with various countries which were formerly large buyers of British products. A point mentioned by Sir G. Croydon Marks is worthy of notice, for it represents so many considerations of a like kind. He said it was useless to suggest *insurance* against the risk of every form of industry unless we also devoted our energies to extending the means of employment for our people, and in this connection he advocated an extension of the system of international credits (as under the Trade Facilities Act) to those who wanted to buy our goods. It will be remembered that Sir Philip Nash laid stress upon this point in discussing electrical trade possibilities with Russia at the annual meeting of the Metropolitan-Vickers Electrical Co.

However, the matter need not be further discussed now, for we are promised a public inquiry. May we hope that the subject will receive more practical treatment than it has done in the speeches mentioned above?

Inflation and the German Electrical Industry.

The inflation of German currency and its consequential heavy depreciation are, of course, reflected in the accounts of the industrial companies, particularly for the past year, where thousands of millions of paper marks meet the eyes of the shareholders without conveying any real impressions as to the actual financial situation of the undertakings concerned. This is true in regard to practically all concerns, including the electrical industry. How the position of affairs is considered in the latter respect was set forth in detail by Dr. Carl von Siemens at the recent annual meeting of the Siemens & Halske Co., when he stated that the accounts should be contemplated as a formal fulfilment of a legal duty, the figures being so grotesque that in future years the company would be ashamed to have had to publish them in a report intended for serious purposes and to serve for the maintenance of confidence in the undertaking.

The figures are declared to express in the clearest manner the incapacity of the present time to master the new problems arising, and the lack of courage to venture to make an attempt in such a direction. The industrial undertakings for years past have urged on the Government for the time being not only to permit but also to prescribe balance-sheets in gold, as these alone would render it possible to recognise the real value of the industry, ensure it the confidence necessary for the possibility of its development, and root out the injurious elements from the whole. The representations made in this sense were of no avail, and it was only when the State, through depreciated paper, could no longer get anything from the taxpayers, and the taxation system failed, that the State itself was compelled, through the condition of distress, again to turn to a stable measure in gold and issue a decree imposing the introduction of balance-sheets in gold.

Although gold balance-sheets are now legally prescribed, it is not yet possible for the German company in question to present such a statement, as various points in regard to the law have still to be cleared up. On the liability side of the account the third emergency tax ordinance has sought to render certain matters clear as, for instance, in the matter of the value to be given to the old obligations in the accounts to be drawn up in gold values. But who has any confidence to-day, it is asked, that the prescribed values will not again be altered? It is necessary to be able to reckon with stable and durable quantities in order to be able to have a regular economic administration, and one of the most important demands of industry will be for this to be recognised and acted upon.

Coming to consider the position of affairs as affecting the Siemens & Halske Co. in particular, Herr Carl von Siemens is reported to have stated that the early months of the new financial year which began last September fell in the period of the greatest money depreciation and the change-over to the gold currency. No special allusion was needed to the circumstance that despite the most strenuous efforts it was impossible to avoid losses in monetary transactions, especially as the shortage of currency rendered it necessary to collect the latter in order to be able to pay the staff and workmen their wages. Notwithstanding the fact that it was essential partly to undertake the payments of wages daily, it was not possible to pay out the actual value that was proposed. In the meantime the stability of the value of the currency which has arrived has brought about a double advantage for the workmen in the sense that they escape the depreciation of the wages paid, and the purchasing value of the wages and the salaries has increased.

The chairman proceeded to state that the introduction of gold accounts with customers through the advent of stable currency was very quickly carried out. Through the economies in unproductive labour which were effected in this manner, the directors were also able to reduce the excessively high number of the staff in relation to the output, although the pre-war conditions were far from being reached. The economic conditions resulting from the change-over to a gold system of charging customers led to a diminution in the orders received, but an improvement in this respect has taken place recently. Although the inland market must always be the most important for the company's manufactures, the improvement in this market must lead to serious economic interruptions in the long run unless an expansion in the export market takes place at the same time, as the articles for the home trade contain materials which have to be obtained from abroad. If the imports of these materials are not paid for by the export of manufactures, the former have to be procured on credit, which to-day is only obtainable for a short period and the high rates of interest on which again lead to an increase in the costs of production. For the goods produced on the basis of foreign credits, the manufacturer in the inland market only receives German money, with which he is unable to pay his foreign debts. The sword of Damocles hangs over those who have raised short-term credits and are unable to repay by means

of exports, owing to the small amount of foreign exchange available in the market. It is necessary, the chairman stated, for all to pay adequate attention to this danger, which must act as a damper on the satisfaction concerning the increase in the orders for home account. In conclusion, he mentioned that the company was still provisionally supplied with orders, and the proceeds from the export trade were meeting the requirements in foreign materials.

The Licensing of Australian Electrical Contractors.

THE question of licensing Australian electrical contractors has recently been revived with some force, and with some effect, for the Minister for Local Government (Mr. J. C. L. Fitzpatrick) has promised to present a Bill for the purpose in the present session of Parliament. The matter has been urged for the past fifteen years, and within recent months the Local Government Department went so far as to prepare a Bill, which, however, was left in abeyance.

The present law covering the subject empowers local authorities to license electrical contractors, but this has been found to be ineffective. Each Council has its own ideas on the subject, and in many cases licences are freely granted without any regard to the recipient's qualifications, or lack of them. Sometimes, on the other hand, very irksome restrictions are imposed, and altogether the arrangement is so unsatisfactory that it is perhaps more harmful to the industry than a total absence of supervision.

The present Bill aims at the setting up of a board of experts which will possess the same powers as the Registration Authority recently instituted in this country, with the important difference, however, that its powers will be enforceable, and registration (or licensing) compulsory. If the Bill becomes law, it will be interesting to observe which scheme, the compulsory or the voluntary, is the more successful.

"Death Rays."

IT is somewhat singular, and wholly regrettable, that the new "ray" which (we are told) has been invented or discovered has been dubbed the "Death Ray." It is presumably of an electrical nature, and up to the present, apart from accidents, electricity has not been used for the intentional destruction of human life except in the United States, where it is the instrument of capital punishment. We should be grieved to see it cast into the same repulsive category as poison gas, and we trust that no opportunity for putting it to the test for warlike purposes will occur for generations to come.

Apart from sensational newspaper reports, there appears to be no reliable information extant as to the nature or properties of the so-called "ray"; Mr. H. Grindell-Matthews has declared his intention of keeping it secret, and has ignored our request for an opportunity to witness a demonstration of its capabilities. Whether there be any substance in the claims that are made—that petrol engines can be stopped from a distance, that power can be transmitted without wires, &c.—we cannot tell. Electrical phenomena are so diversified, and we know so little, even now, as to their limitations, that only a fool would deny the possibility of such achievements, though the means whereby they are to be effected may be wrapped in mystery. After the discovery of X-rays, radio-telegraphy, radium, electrons, &c., it is impossible to set bounds to what the future may bring forth. Hence, whilst we are disposed to be sceptical, we are willing to be convinced, and we shall await the verdict of Mr. H. E. Wimperis, Acting Director of Scientific Research, and the other Government experts, on the invention with interest. Incidentally, the newcomer in this field, Dr. T. F. Wall, is said to have applied for a patent, and therefore *his* method of death-dealing, unless annexed by the Government, will necessarily be made public in due course.

We do not anticipate that any Government Department or any business man will pay for a secret process; the day of secrets is over. In our opinion, the new "ray" will have no commercial value unless it can be applied to industrial purposes.

According to the *Evening Standard* of Tuesday, Mr. Grindell-Matthews declined to allow his ray to be tested with an engine to be provided by the Air Ministry, and rejected a proposal that, in the event of success, he should be paid £1,000, and should allow a period of 14 days for further detailed examination and development. At midday on Tuesday he flew over to France to resume negotiations with a French company, which, he stated, had a contract already drawn up. Nevertheless, he has granted the British Government until to-day to make him a better offer.

Imperial Wireless Telegraphy.

THAT which we feared is coming to pass: a fresh hare has been started, and once more the establishment of direct wireless communication between the various parts of the Empire is threatened with delay. Strong exception has been taken in Australia to the recommendation of the Donald Committee that the Post Office should retain the Imperial service entirely in its own hands at the British end, but the more ominous circumstance is the renewed announcement by the Marconi Company that the new system of directive telegraphy which it has developed has been brought to a point "at which it is possible to say with confidence that it will revolutionise the practice of long-distance wireless telegraph communication." We welcome every step forward in the development and improvement of radio telegraphy, but as we pointed out in our issue of March 7th, we cannot wait for perfection to be attained. No sooner has this new improvement—which appears still to be in the future—been accepted than it will be superseded by another: and all the while we remain without a wireless service of any kind! Moreover, an agitation has been commenced for the purpose of bringing the endless debate to the floor of the House of Commons, where the matter will again become a political bone of contention. And we are calmly informed by the *Financial Times* that "conferences are taking place with the Empire Wireless Committee, and it is pleasant and reassuring to learn that the company will endeavour to co-operate with the Government"!

Words fail us.

Cable-Making Success.

OUR readers will find a good deal of interesting matter in the speeches delivered by Sir Fortescue Flannery and Sir T. O. Callender at the annual meeting of Callender's Cable and Construction Company, Limited, which are reported in our "City Notes" to-day. The brief review, by the managing director, of the company's successful activities overseas, reminds one that the reputation of cables manufactured by British companies stands unrivalled throughout the world; also that as electrical development takes on an accelerated pace everywhere the outlook for this department of the electrical industry must become brighter and brighter, bearing in mind the large proportion that cables bear in relation to the total value of the average electrical installation contract.

Electrical Development.

RECENT utterances on the part of several members of the Government—notably Mr. Sidney Webb, Mr. Frank Hodges, Mr. T. Shaw, and Miss Bondfield—indicate that they are keenly interested in the utilisation of electricity, and are determined to leave nothing undone that will further the progress of electrical development throughout the country. This attitude is very satisfactory, and seeing that it has never before held office, the Labour Party cannot be held responsible for the legislation which has retarded the progress of electricity in the past. But we hope it will be content to let the electrical industry now work out its own salvation—Government interference is fraught with peril.

Extensions at Worcester.

The City of Worcester obtained its first Electricity Order in 1890, and the supply was commenced four years later. Steady progress has been maintained since that time, and additions have been made as necessary until a short time ago when the plant consisted of four Belliss triple-expansion engines coupled to Bruce Peebles and Electric Construction Company's generators, and two 1,500-kW B.T.-H. turbo-alternators, giving a total output of 4,680 kW. In addition to this the Corporation has a water-power installation at Powick, which provides an average of 750,000 kWh per annum; this is operated by disabled ex-Service men.

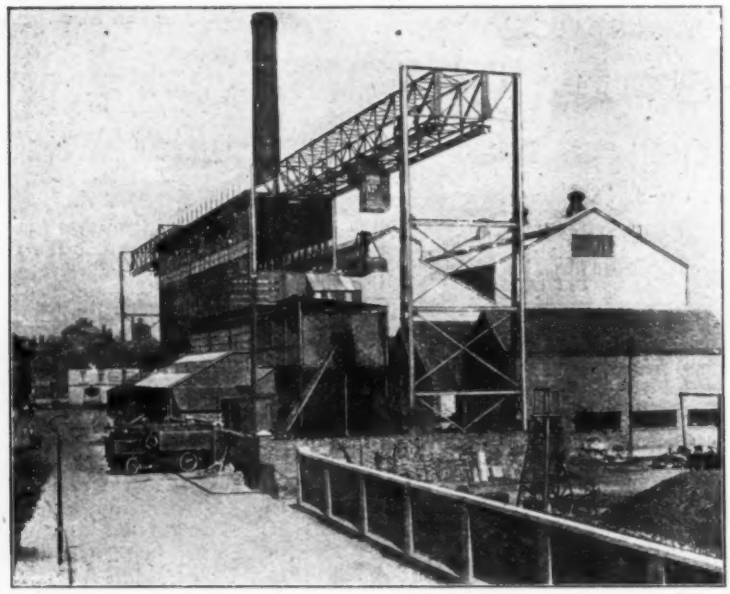


Fig. 1.—Exterior of Station, Showing Coal-Handling Equipment.

In 1920, when the question of electricity supply areas was first mooted, the Corporation was advised that it was not desirable to discard its 50-cycle system as would be necessary if its district were merged into the Shropshire, Worcestershire and Staffordshire Power Company's 25-cycle area. Eventually an agreement with the Power Company was entered into for the Corporation to extend its supply area from 5 to about 40 square miles; this arrangement received the approval of the Electricity Commissioners. The Corporation therefore continues to generate its own energy, and to enable it to cope with the anticipated expansion the Commissioners also allowed the undertaking to be extended. Thus the Worcester area is an autonomous "island" bounded on all sides by the Shropshire Power Co., and forming a part of the South-West Midlands Electricity District.

The extensions are remarkable for the amount of resource shown, and also on account of the fact that practically the whole of the work was carried out by direct labour, a large number of unemployed local men having been provided with work. After inquiries for new plant, the chief engineer (Mr. C. M. Shaw, M.I.E.E.) inspected several Disposal Board installations, and finally purchased from the Government Rolling Mills, Southampton, a 3,000-kW turbo-alternator, with condenser and auxiliaries, three Stirling boilers, with forced and induced draught plant, 528 and 323-tube Green's economisers, and a 40,000-gal. per hour Hall feed-pump, switchboard, &c. To accommodate the new plant it was necessary to extend the power station considerably and also to improve the coal-handling arrangements (see fig. 1). The engine room (fig. 2) was extended 66 ft. at one end, the width being 48 ft., *i.e.*, the combined width of the old engine and switch rooms; the height was increased to 45 ft. A new 25-ton Morris crane traverses the new power house, which has been designed with a view to extending over the old power house with a minimum of interference with working. Messrs. Heenan and Froude supplied the steel structural work and the telpher equipment mentioned below, but apart from this, the whole of the work, including removal and re-erection, was carried out by direct labour. The boiler house was extended, and new bunkers were erected.

There is no direct connection with the railway, and it is therefore necessary to bring the coal from the railside to the works in steam wagons. Upon arrival it is tipped into a pit of 500 tons capacity. The telpher equipment consists of a Royce traverser fitted with a Barnard 1-ton self-dumping grab. The coal is taken up by the latter, weighed, and discharged into the 100-ton bunkers over the boilers. From the bunkers the coal passes to 2-cwt. Avery automatic weighing and recording machines before entering the furnaces. The

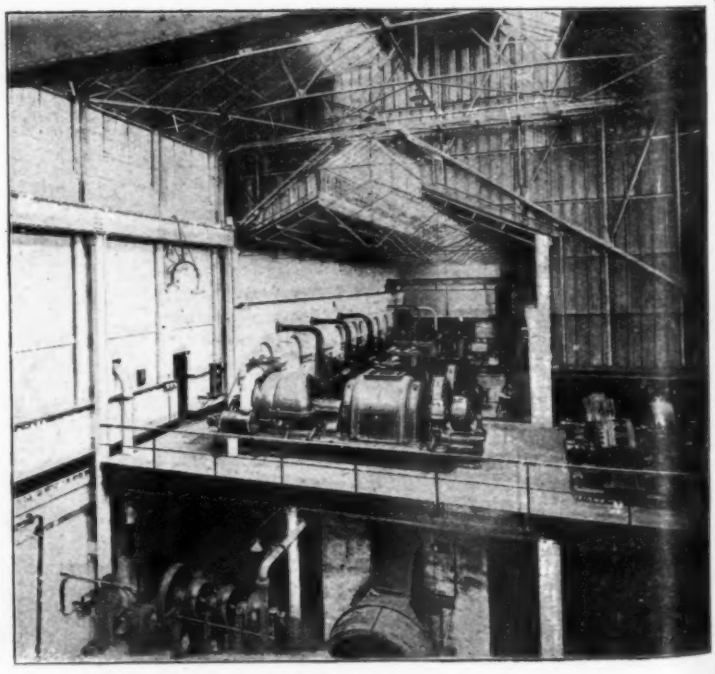


Fig. 2.—Interior of Station Showing new 3,000-kW Set.

ash falls into hoppers beneath the furnaces and is "tapped off" periodically into 10-cwt. tubs running on light-gauge rails to an ash hoist. The hoist was constructed at the works, the electrical equipment being supplied by Empire Control, Ltd. The ash is carried to a 150-ton hopper erected over the yard, from which it is transferred by gravity to steam wagons.

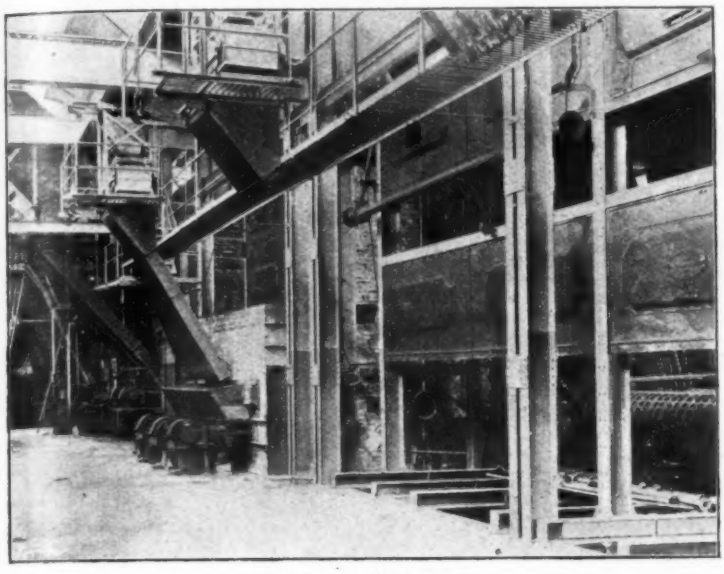


Fig. 3. Boiler House.

Only one of the "new" boilers is at present on load, although the other two are erected in skeleton form, on new steel framework (see fig. 3). The boiler has been improved by the chief engineer and his assistants, the heating surface being increased from 5,600 to 8,282 sq. ft. This was accomplished by increasing the vertical centres of the steam drums from 17 ft. to 20.5 ft., fitting two new rows of tubes, and enlarging the superheater. The Underfeed "E" type stoker was replaced by an Erith-Riley, nine-retort stoker to enable low-grade fuel to be burned and to increase the grate area from 127.5 sq. ft. to 137.75 sq. ft. to cope with the larger evaporative capacity. The fuel used is principally pit screenings; this has a calorific value ranging from 9 to 11 thousand B.th.u. per lb. The feed water is taken from the River Severn, upon which the station is conveniently situated; little treatment is required. The boiler and economiser flues are provided with an efficient de-sooting arrangement. The flues are so made that they consist of a series of small hoppers terminating at the bottom in 4-in. dia. tubes. The outlets of the tubes are covered by slides, which are easily removed, allowing soot and riddlings to fall into tubs running on a subsidiary track to the ash dump (see fig. 5).

Fig. 5.—Flue De-sooting Arrangement.

Fig. 6.—Part of Malvern Transmission Line.

The working pressure of the older boiler plant is 180 lb., while that of the new plant is 210 lb. The steam range and valves have therefore been arranged so that either the old or new boilers can supply the new or old turbines.

The turbine is a standard British Thomson-Houston Curtis turbine designed to run at 3,000 r.p.m., with steam pressure at 200 lb. per sq. in. and 200 deg. superheat. Under full-load conditions the steam consumption is 12.05 lb. per kWh. The generator was originally a 3,000-V machine, but the stator was re-wound by the British Thomson-Houston Co., Ltd., and the generating pressure is now 6,600 V. The machine is designed to give its rated output, 3,000 kW, at a power factor of 80 per cent.; the current is three-phase, 50-cycles.

The turbine auxiliaries include a Cole, Marchent and Morley surface condenser with an Edwards air pump. When dealing with 40,000 lb. of steam per hour with cooling water at 65 deg. F., a vacuum of 28.5 in. is maintained with the barometer at 30 in. Circulating water is also obtained from the river.

Fig. 4.—Cable Subway.

The old generating plant gives a 2-phase supply at 2,000 V, 50 cycles. A three-phase supply is obtained by means of Scott-connected transformers. The current is converted by motor-generators for traction and the supply of a small central section of the district.

D.c. distribution is gradually being abandoned in favour of a.c. one, two and three phase.

Extensions of the e.h.p. switchgear being rendered necessary, the opportunity was taken of re-arranging the whole cable system in connection with the boards. The switchgear for the new machine comprises a generator panel and three feeder panels. The gear is of the stone-cubicle, hand-controlled type supplied by the B.T.-H. Co., and fixed by the Department's staff. A further eight feeder equip-

ments are to be installed. To house the new switchgear, to bring the control panels into line with the existing 2,000-V board, and to provide ample space for the new feeders, the d.c. feeder control board had to be removed and re-erected. The switch galleries were underpinned and excavated to a depth of 8 ft. A tunnel 14 ft. wide and about 140 ft. long was driven. This was carried out with Ingersoll-Rand pneumatic hammers and shovels by unskilled unemployed men. The compressed air was provided by a simple portable compressor set made up from disused plant found at the works. These excavations have provided a cable subway (fig. 4) of a size very seldom seen in an electricity works. It has permitted of the interconnecting cables being placed in widely-separated racks which facilitates jointing, inspection, &c. A chamber at one end of the tunnel accommodates two 100-kW Berry transformers for the two-phase works auxiliaries. The engineer was aided in his scheme by the earth formation of the district. There is a depth of 6-8 ft. of soft subsoil with a solid foundation of rock marl. Nevertheless, the work is unique on account of the nature of the tools and material employed, and the unskilled labour which carried it out.

Since the new turbine has been in service the coal consumption has been reduced from about 5 to 3.8 lb. per kWh; in comparing this figure with other stations due regard must be paid to the very low-grade fuel employed.

The bulk of the distribution of energy from the works was carried out by 2,000-V single-and two-phase concentric mains. Recently an extensive system of three-phase, 6,600-V cables has been laid by the unemployed to various points in the city, the whole forming a ring system, so that eventually energy will be generated and transmitted at 6,600 V to primary sub-stations, in which Scott-connected transformers will be installed, thereby greatly extending the capacity of the original 2,000-V networks which will become primary distributors, secondary sub-stations being provided to reduce the pressure to 200 V. This system of distribution was commenced some three years ago and will allow considerable increases of demand to be dealt with without disturbance of streets.

The Corporation has a good deal of overhead distribution, and has lately given a bulk supply to the Malvern Urban District Council. Two miles of the cable is underground, whilst the remainder of the distance (six miles) is covered by overhead lines (fig. 6). The initial supply will be 300 kVA, but the line is designed for an ultimate load of 1,000 kVA at 6,600 V, with provision for an ultimate stepping-up of pressure to 33,000 V. Messrs. Henleys constructed the overhead transmission line.

There are many other points in connection with the work that deserve more extended attention, such as the discovery of a natural sump, in the shape of a disused well and tunnel, which has been put to good use by means of a system of underground drain-pipes from many parts of the station, put in by means of the Mangnall-Irving thrust borer.

Another undertaking is the construction of a new circulating-water pump house, and at the present time a number of unemployed are engaged in sinking a deep reinforced-concrete caisson alongside the chimney foundations in the station yard to form a suction well.

On the welfare side, a mess-room, bath room and lavatory have been arranged within the station, and a recreation ground and institute are in course of execution in the precincts of the station. The building is being erected by the voluntary labour of the Corporation's staff, which indicates the existence of a very good spirit at the works.

The above description fails to do full justice to the labours of Mr. Shaw and his chief assistant, Mr. C. D. King, to whom we are indebted for these particulars.

Lightning Conductors on Naval War Memorials.

By KILLINGWORTH HEDGES.

THREE Naval war memorials have been erected by the Imperial War Graves Commission, at Chatham, Plymouth, and Southsea; the first has been ready for some time, and has recently been dedicated. A sectional sketch of the top of the memorial is given in fig. 1; it takes the form of an obelisk, about 100 ft. in height, faced with Portland stone, with fine joints. On the top is a copper ball supported by four large bronze statues. The ordinary method of fixing a tape or stranded conductor was considered to disfigure the clean face of the obelisk; a 1½-in. copper tape was therefore run inside, starting from an air terminal at the top of the ball, fixed on a specially-designed hollow brass casting, on which the tape was jointed by metal, and running through a 2¾-in. copper tube (used to hold the ball in position). At the lower end of the tube there are branch connections to the statues and all the metal work. The conductor is supported by hold-fasts (on the air to earth system) away from the walls, descending alongside the galvanised iron ladder and rain-water pipe, to which it is bonded by lead-faced copper strips. At the lower end, from an Admiralty test box, it branches to the two sets of earths, passing through earthenware tubes, which also carry the drip water from the top of the obelisk, which is used to keep the earths moist.

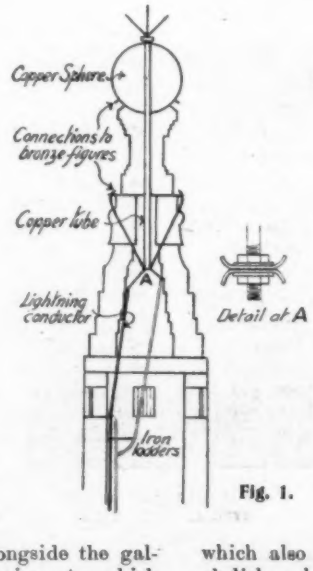


Fig. 1.

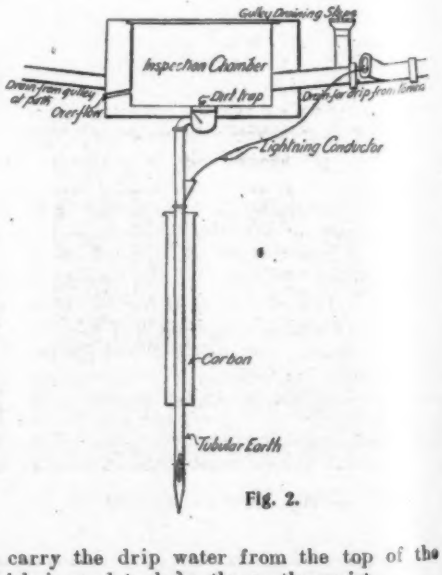


Fig. 2.

The Chatham memorial is on very high ground of dry chalk with flints, covered with clay loam.

To secure conductivity, artificial earths were made by four 8-in. holes bored to a depth of 8 ft., each having a hole at the bottom to receive a 2-in. standard tubular earth, which was firmly driven 3 ft. into the chalk. The space left in the bore outside the tube, &c., was filled with broken carbon, and at the top the bore was enlarged to form a basin; into this basin the surface water collected at the bottom of the steps, and from the existing pathway, and the drip water from the top of the obelisk, was led, so that the carbon both inside and outside the tubular earth is kept permanently moist, except perhaps in very dry weather, when it will have to be watered by hand.

The arrangement of one of the earths fixed in each inspection chamber is shown by fig. 2. Any dirt is separated by means of a trap fitted in the floor of the chamber, which is provided with an overflow.

The four earths are arranged in parallel, and show a resistance of 5.9 ohms; this result has been obtained without having to bore through the chalk. The writer was told that at one of the Government aerodromes during the war, the extension tube of a similar earth was sunk to over 100 ft., and even at that depth the resistance was much higher.

The Plymouth Memorial is erected on the Hoe, on a foundation of loose rock. The arrangement is similar to that at Chatham, but as the two earths near the base of the memorial gave too high resistance, a conductor was run under the surface of the ground to a point away from the base, and two more tubes were sunk and surrounded with carbon; the four earths were connected in parallel, greatly reducing the resistance.

The Southsea obelisk is in course of erection on Southsea Common; the ground being waterlogged, a foundation of ferro-concrete piles was necessary. Two tubular earths are being provided, and judging from the conductivity of similar earths which were fixed some time ago in the naval dockyard, the resistance will be low. The supply of all the materials and the erection of the lightning conductors were carried out by Messrs. W. J. Furse & Co., Ltd., Nottingham, to the specification of the writer, consulting engineer to the Imperial War Graves Commission, for the special work.

An article on "Tubular Earths" by the writer appeared in the ELECTRICAL REVIEW of May 3rd, 1918; to confirm the opinion then expressed as to their advantages over plate earths, the following extract from a Technologic Paper of the Bureau of Standards, Washington, U.S.A., may be of interest:—

"For many purposes driven pipes are economically satisfactory, especially if the soil is deep. They serve very well for lightning rods, lightning arresters, low-voltage circuits fed by transformers, and for other electrical circuits and apparatus which do not require resistance to flow of current to earth of less than a few ohms. They possess a marked advantage in that connection between pipe and ground wire can be made above the surface of the soil, enabling easy inspection; moreover, the ground area required for an earth connection of this type is small, making for convenience in some places where excavation is out of the question, because of restricted space or pavements. Where it is necessary to make the earth resistance as small as possible, much can be accomplished by driving two or more pipes even as close as one foot or so to each other. A table given, shows that two pipes will give a resistance of approximately 65 per cent., and three pipes at 120 degrees apart, 53 per cent. of a single pipe."

House Services from Overhead Mains.

By J. M. C. FIELD.

ONE advantage of overhead lines for low-pressure distribution work is the ease with which house connections can be "tapped on," and the fact that the low cost of these connections enables the supply company to consider applications from very small consumers.

It is not always realised, however, that these service "lead-ins" are undoubtedly the weakest part of the whole distribution network, and a very probable source of trouble.

It will generally be found that there is a considerable amount of cable, aerial, lead-in tails, &c., which is subject to damage by weather and general wear and tear, between the main line and the meter board. It is therefore highly important that fuses should be inserted at the nearest possible point to the tapping from the actual main.

There are several forms of weather-proof fuses for pole fixing on the market, and one most excellent fuse of the cartridge type is arranged to clamp directly on the main line itself, the service wire connection being taken from the bottom of the fuse; this obviates the "tail" between the main and the fuse, and also the soldered or clamped joint of the "tail" on to the main.

The only disadvantage of having the fuse in this position is that a ladder is necessary to effect repairs, but this is only an infrequent occurrence, and it is more than outweighed by the advantages afforded by the fact that if a fault develops on a service, the small capacity fuse blows, and only one house is affected. On the other hand, were no pole fuse provided, the sub-section fuse would blow, putting a whole street, or streets, into darkness, and perhaps not until the "short" in the service had caused considerable damage and perhaps set the house on fire. Again, such a fault might cause the sub-section fuse to blow, but not disclose its locality, and cause delay and annoyance in tracing it out.

With regard to the best method of running the service line, for short spans a lead-covered or cab-tire cable can be run right through from pole cross arm to meter board, being clipped to the pole down to the level of the most convenient point of entry to the house, and stretched across the span suspended by a catena wire.

Fig. 1.

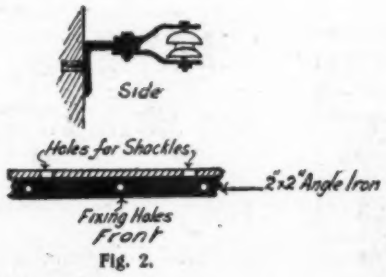


Fig. 2.

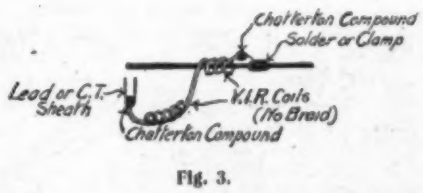


Fig. 3.

Round C.T.S. can be suspended without a catena for short spans, owing to its light weight. It must, however, be supported at each end by suitable insulators.

It must be remembered when clipping a lead-sheathed cable to a pole or outside wall, that brass saddles must not be used, or electrolytic action will follow; the most serviceable saddle can be made from the lead stripped from the cable ends, fixed with zinc or galvanised iron nails.

For spans greater than about five yards it will be found far better and cheaper to fix a bracket to the building and use bare copper wire supported on insulators from pole to house, and a v.i.r., lead-covered, or C.T.S. lead-in through to the meter board. If lead-covered cable is used for this purpose the sheathing must, of course, be earthed, which is a troublesome performance.

To save the labour and expense of fitting an extra cross-arm to the pole, side brackets or swan-neck stems can be used to mount the insulators for light wire, with advantage.

On the house end, one of the two simple brackets shown in figs. 1 and 2 will be found to meet nearly every occasion; they can be fixed to old brick and stone houses very effectively by No. 14 Rawlplugs, if no wood fixing is available.

All ironwork must, of course, be carefully painted before and after erection.

For modern brick houses, swan-neck insulators can be used if a hole is carefully "jumped" and suitably plugged.

A bracket which would be most suitable for cases where the service can be put in while the house is in course of construction, was recently described in the ELECTRICAL REVIEW. A piece of gas pipe was run right through the wall, which served the dual purpose of securing the bracket by means of lock nuts, and as a conduit for the leading-in cable.

Where crossing below G.P.O. lines, through trees or near windows, P.B.I. insulated aerial wire may be advantageously used.

Now we come to the weakest part of the whole service—that part of the lead-in cable which is exposed to the weather where the joint is made on to the aerial wire.

Preferably, a sealing box should be used to protect the cable where it leaves its conduit or sheathing, and the wire should be run bare from there to the joint, as the rubber where exposed always seems to perish in time. If a sealing box is dispensed with, the cable ends should be carefully sealed with Chatterton's compound.

The braid and tape should be stripped right back, and the rubber-covered wire coiled up, then jointed to the aerial wire, as in fig. 3, which has a springing effect and minimises the likelihood of the wind breaking the connection off by constant movement to and fro.

Where it is required to connect up a number of houses in a row, and where the meter board is fixed too far inside the house to make looping-in practicable, a cheap and efficient joint box is afforded by an ordinary watertight single-pole ironclad fuse, drilled and tapped to receive ¾-in. or 1-in. conduit.

It is mounted vertically on the wall, and the top hole is plugged up with a stopper; the three twin cables are brought in through a bush through the bottom hole, and the existing fuse terminals can be used as connections. The fuse handle is, of course, removed.

The position of the meter board is another important point; while it is desirable to locate this as near the point of entry into the house as possible, it is very unwise to put it in an inconvenient position, such as a bedroom or bathroom, or valuable time is likely to be wasted at every meter reading.

Last, as to the meter board: if this is fitted with corner insulators the purpose of the insulators is at once nullified if the edge of the board is jammed up against a ceiling or woodwork.

The writer has seen, on more than one occasion, the lead sheathing of a cable actually clipped to the insulated meter board, thereby "earthing" it again. All conduits, metal sheaths, &c., should, of course, be kept clear of the insulated part of the meter board.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Electrical Wood-working Tools.

At the recent Building Exhibition at Olympia, Messrs. A. A. BYRD & Co., 11, Queen Victoria Street, E.C.4, showed a number of "Wallace" wood-working machines of American manufacture, driven by electric power. The motor is a corporate part of these, and on this account they are properly termed electrical machines. The range comprises circular saws, band saws, planing machines, jointing machines, and lathes.

Fig. 1.—The "Wallace" Universal Bench Saw.

The circular saws are produced in "plain" or "universal" patterns. One of the latter type is illustrated in fig. 1. A .5 h.p. motor is built into the body; a large "Fabroil" gear wheel is mounted on the armature shaft and this engages with a small steel pinion on the saw spindle. The gear runs in an oil chamber. The motor runs at 1,800 r.p.m. and the saw at 5,200 r.p.m. The machine is started up by a toggle switch conveniently mounted on the motor. The table is of steel and the slot in it permits of the saw's being tilted. The whole of the motor and saw gear is in one unit, and by means of handwheels can be raised and lowered or inclined at any angle from —5 deg. to 45 deg. An automatic guard is fitted. The band saw motor is similarly geared to the saw mechanism and

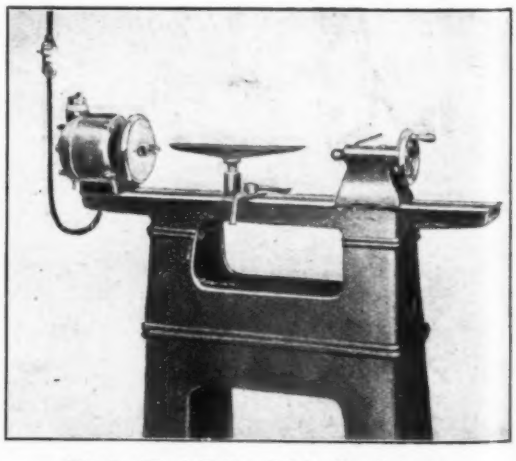


Fig. 2.—The "Wallace" 6-in. Bench Lathe.

is again a part of the machine, being mounted at the side of the stand. The planer has a motor connected to the cutter head, bearing three knives, by a flexible coupling. Special arrangements for rabetting are made, and the blades are automatically guarded. The jointer is of similar design.

In the lathe (fig. 2) the ball-bearing motor is built into the headstock and the faceplate and centre are mounted on its shaft. The motor runs at a constant speed of 3,400 r.p.m.,

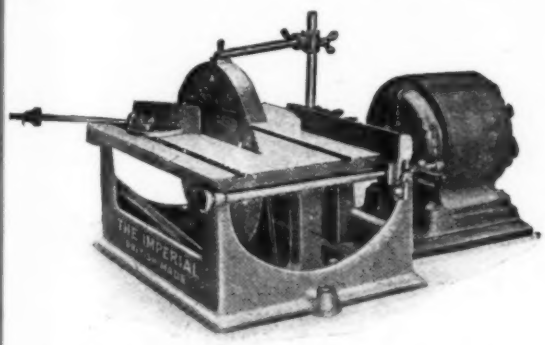


Fig. 3.—"Imperial" 12-in. Electrically-driven Saw.

which is said to be the ideal speed for work which falls within the capacity of a 6-in. lathe. The motors of all these machines are totally-enclosed.

A range of woodworking tools of British make has been introduced by the HOLLIS WOODWORKING ENGINEERING CO., LTD., Imperial House, 95, Old Street, London, E.C.1.

The range comprises a 12-in. electrically-driven saw bench, and two sizes of electrically-driven bench planers. In each case the machine is mounted on a cast iron base plate, and the motor is applied direct to the spindle. Ball-bearings are used exclusively throughout. The saw bench (fig. 3) has a tilting table with two grooves, and an adjustable fence with fine adjustment. The guard complies with the Home Office regulations.

The planing machine (fig. 4) is made in two sizes, 4 in. and 6 in. The planing is circular, and the machines can be equipped with a bridge-type telescopic guard. Both these

Fig. 4.—"Imperial" Electrically-driven Bench Planer.

machines will perform their functions with the greatest ease. The saw gives a cut 4 in. deep, and has been tested to rip 3-in. hard oak at the rate of 24 ft. per minute. The planing machine gives a smooth finish, and can be used for planing, surfacing, jointing, and moulding work.

The machines are supplied with all the necessary switchgear, and by closing a small switch fixed on the machine it is immediately set running. Where it is desired to remove the machines from point to point an automatic combined switch and plug of the "Kingsway" type is embodied, and the greatest care has been taken to comply with Home Office regulations on both the electrical and mechanical side. The machines can be supplied for connecting to any source of supply.

The "Lampe à Bouche."

Bicycle lamps are not popular in France. In the country the machines are ridden after dark without light, while in towns the correct thing appears to be to carry a small Chinese paper lantern suspended from the mouth. This practice appears to be almost universal. For those who wish to have light, but do not like the ordinary lamp, a new form of lamp has been placed on the market; it is held in the mouth and worked by blowing like a whistle, fig. 5. The one disadvantage about the business seems to be the blowing part, although the makers distinctly state that this will have a very beneficial effect upon the lungs; and, after all, the lamp need only be blown on sight of a policeman! The outfit comprises a tiny turbo-generator, which can be made to revolve at 3,000 r.p.m. by merely breathing into the mouthpiece. The lamp is provided with a special tungsten-thorium fila-

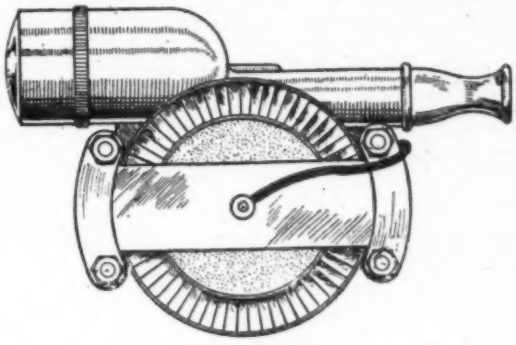


Fig. 5.—The "Lampe à Bouche."

ment, which gives a good light at 2.5 volts with only .05 ampere. The little turbo-generator runs so easily that, after blowing into it, the turbine will continue to revolve for a full minute. The "Lampe à Bouche" is made by Messrs. Perron et Nattier, 4, Passage Montbrun, Paris, 14.—*Cycling.*

A New Soldering Compound.

A new soldering compound has recently been placed on the market by Messrs. NAPIER-KIMBER, LTD., 6, Percy Street, Tottenham Court Road, W.1. The compound is said to have exceptional properties; it tins, cleans, and solders in one operation. All that is necessary is to heat the material to be soldered, and apply the compound. No matter how dirty the metal is, we are informed that it will immediately be evenly and thoroughly tinned, and a permanent joint can then be made. The compound is non-acid, and quite harmless.

Legal.

An Australian Engineer Compensated for Injury.

AN action recently brought by one of the shift engineers, formerly employed at the Waddamana power station (Tasmanian Government Hydro-Electric Department), against the department for injuries incurred while operating an oil switch, was decided on March 28th. The jury found in favour of the plaintiff, and awarded him £850 damages. The plaintiff's claim was for £1,500.

The case arose out of an accident which happened to plaintiff (A. A. Rodman) while he was in the employ of the Hydro-Electric Department as an assistant engineer. It was alleged by the plaintiff, and conceded by the defence, that Rodman was operating an electric switch, when it "blew out," and he received severe injuries. Plaintiff further contended that the department installed the switch in a dangerous way, and that it overloaded its equipment so that it was a danger to the operator; that it installed ineffective fuses of too small a size; that it did not operate the safety valves as they were intended to be operated; and that the overloading caused the oil to deteriorate, so that it lost its non-conducting properties, with the result that an explosion occurred, and plaintiff received injuries. The Crown alleged that the accident was caused through the plaintiff "feeling in" on the switchboard instead of jamming in the lever with one direct movement. The senior shift engineer at the power station at Waddamana said that two months prior to the accident he saw Rodman "feeling in" a switch. Witness remonstrated with the plaintiff, who said he always did it in that manner. Witness regarded the switch operated by Rodman on the day of his mishap as perfectly safe. Plaintiff could have turned off all the power to the sub-station by a master switch, had he so desired, and thus saved himself any risk if he thought there was any.

The engineer and manager of the Hobart tramways stated that he regarded "feeling in" as a dangerous practice, on account of the likelihood of an explosion occurring as a result of the arc between the contact points meeting the explosive gases in the oil, which were caused by the heating of the oil.

The following questions were put to the jury by the judge:—(1) Was the accident caused by the neglect of the department? (2) or through pure accident without anyone's neglect? (3) in either event, assess damages; (4) was the accident caused partly by neglect of the department, the plaintiff's neglect in part contributing to it? (5) if so, in estimating the damages give due regard to the extent to which the plaintiff, by his own negligence, contributed to his own injury, and assess damages accordingly; (6) was the accident caused solely by the neglect of the plaintiff? The jury returned a verdict for the plaintiff, answering No. 1 question in the affirmative.—*Industrial Australian and Mining Standard.*

British Thomson-Houston Litigation.

IN the Chancery Division, on May 22nd, Mr. Justice Eve heard an action by the British Thomson-Houston Co., Ltd., against A. Horn, London, and J. Kremenezky, Vienna, to restrain infringement of plaintiffs' 1909 patent for incandescent electric lamps.

Mr. TREVOR WATSON, for the plaintiffs, stated that the two defendants had put in one defence, but they had not appeared. Some time ago the plaintiffs brought an action against the Essex Electrical Stores, a concern which was run by a man named Horwood, who gave plaintiffs certain information as to the source of his supply of the lamps. As a consequence plaintiffs were in a position to place Mr. Horwood in the witness-box to explain where he obtained the lamps, namely, from the second defendant, through his agent, Horn.

Evidence to this effect was given by Mr. HORWOOD, and Dr. OBERLANDER stated that the filaments of the lamps in question consisted substantially of pure tungsten which was ductile at ordinary temperatures. Such a filament could only be produced by following the directions of plaintiffs' patent.

His LORDSHIP granted the usual order against the defendants, with costs.

Motions for judgment in default of defence in actions by the British Thomson-Houston Co., Ltd., against George and Jobling, Neon Electrical Supplies Co., Kessler & Co., Krasinsky, and Woodall, came before Mr. Justice Romer in the Chancery Division on May 23rd.

Except in the case of the first-named defendants, which was adjourned, injunctions were granted restraining infringements of the plaintiff company's patents relating to incandescent electric lamps, with costs.

Heath Pritchard, Ltd., v. Pascoe.

IN the Mayor's and City of London Court, before Mr. Registrar Dell, on May 22nd, the plaintiffs, electrical engineers, claimed £2 10s. for work done on an electrical installation in defendant's residence at Dollis Hill. The defendant refused to pay the account, saying that the work was not done properly in the beginning. Plaintiffs said that breakdowns which had occurred were due to the dampness of the house and to defects in a hot-water system; the Willesden Council had passed the installation when it was first put in. Defendant said that an inspector of the Council had condemned the work, but in reply to the Registrar said that he was not calling any witnesses from the Council. The Registrar said that he was satisfied that the work had been done properly and the account must be paid; judgment was entered accordingly. Defendant asked for a remand to enable him to procure evidence, but the Registrar refused this, stating that the defendant would have to come to Court with much stronger evidence if he desired to upset the judgment.

Claims Against the London Electric Railway.

SITTING at the Auctioneers' and Estate Agents' Institute, Mr. J. Seagram Richardson, as Umpire, heard claims by Mrs. J. COISH and Mr. S. T. SMURTHWAITE for £600 and £1,000 respectively, as damages for the depreciation of Nos. 44 and 46, Golders Green Crescent, Golders Green, alleged to be due to the construction by the London Electric Railway Company of a viaduct and bridge in front of those houses. Mr. A. Boraston was counsel for the claimants, while the Hon. R. Stafford Cripps represented the railway company.

After hearing expert evidence, the Umpire reserved his award, which will take the form of a special case for the opinion of the High Court.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Cobwebs and Trade.

It is not surprising that every effort is being made to impress the new Government with the urgency of advancing the country's overseas trade. Apart from other excellent reasons, this course is advisable, if not absolutely necessary, because many members of the Cabinet are believed to be so unbending in the orthodoxy of their economic doctrines that they would willingly leave all matters connected with the marketing of goods to the free play of individual energy. It cannot be denied that Mr. Sidney Webb was rather a long time in making himself acquainted with the functions of the Board of Trade. During the process he gave the impression in the House of Commons that, in his opinion his Department did not exist in order to find markets for particular industries. The nature of this revelation was scarcely made less startling by Mr. Webb's subsequent indication that what he really said was that he was unaware that it was part of the duty of the Government to secure a market for particular manufactures. Apparently his new colleagues had not made him acquainted with the operations and responsibilities of the Department of Overseas Trade, which the Board, in conjunction with the Foreign Office, is supposed to control. It would seem that cobwebs were about, proceeding perhaps from the new President, or at any rate, due to failure in his capacity of new broom to sweep them away. The present Government cannot close its eyes to the fact that most of the existing difficulties in increasing export trade are due to high costs of production in this country. Is it afraid of throwing the light of publicity on this phase lest it be accused of indirectly bringing about a reduction in wages?

The air was to some extent cleared last week in Parliament when, in reply to a question concerning the cost, personnel, and work of the Department of Overseas Trade, Mr. Webb had to confess that it *was*, in fact, part of the work of the Board of Trade, and notably of the Department of Overseas Trade, to supply the business world with all the knowledge that could be obtained, and especially to furnish individual traders with all possible information and facilities to assist them in their business. He added that he proposed to promote such Government action to the utmost degree. It now remains for Mr. Webb to make good his promise, and in this connection news is eagerly awaited of the composition of the new committee of inquiry on export trade. One may recall that the Department of Overseas Trade has an advisory committee on which engineering interests are represented.

Cosmos.

London, *May 26th*, 1924.

Cleaning Dirty Insulators.

With reference to the article published in your issue of the 9th inst., it may be useful to state that the method of washing insulators quoted in the Post Office Technical Instructions, No. 13, has been superseded for some time. A mixture of "Quebracho" and caustic soda has been used by this department for the past two or three years on the general lines suggested by a correspondent in the ELECTRICAL REVIEW in June, 1917. Particulars of the Post Office results obtained with this method were published in the *Post Office Electrical Engineers' Journal* in April, 1922. The formation of vein cracks, due to over-boiling or sudden changes of temperature mentioned by your correspondent, has come under notice in the Post Office trials. This difficulty can be overcome by the use of a warming tank, or by shortening the period of boiling.

At the Post Office Stores Department, Fordrough Lane Depôt, Birmingham, steam-heated tanks have been provided for conveniently dealing with large quantities of dirty insulators. The insulators are placed in perforated buckets, and an overhead carrier is provided to facilitate the immersion of these in the different tanks, and for draining purposes.

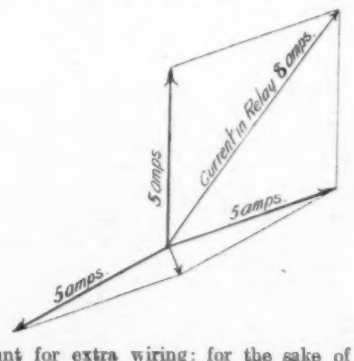
It may be mentioned that a new edition of Technical Instructions No. 13 is in preparation, and will shortly be published.

W. J. Medlyn,
Superintending Engineer,
Manchester, *May 19th*, 1924. *South Lancashire District.*

Overload Protection by "Z" Connected Relays.

The writer of the article under the above heading in your issue of the 23rd instant appears to have overlooked the fact that under fault conditions one phase will almost certainly lag or lead relatively to the other phases. The accompanying diagram shows the effect of displacement of one phase; the current in each phase is equal, say, 5 amperes, but the current in one relay is the equivalent of 8 amperes, more than sufficient to operate a relay set at 50 per cent. overload.

The difference in the cost of two single-pole induction overload relays and one triple-pole relay is about £8, allowing a



small amount for extra wiring; for the sake of this small saving, all the advantages of accurate relays are sacrificed, and it would be better to install three current-transformer-operated trip coils, which would be cheaper and more accurate than two single-pole relays connected in "Z."

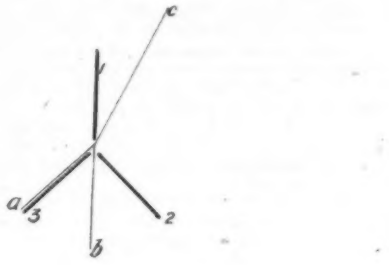
T. J. Barfield.

London, *May 23rd*, 1924.

The praiseworthy effort in your issue of the 23rd to expound the mysteries of the "Z" connection is unfortunately marred by a slip in the first vector diagram (fig. 2).

The values of the relay currents I_1 and I_2 are shown 120 deg.

part, hence under normal conditions the resulting secondary current in the common lead would also be of the same value, and the relays could be inserted in any two of the wires. It is well known that with such a connection the relays must be inserted in certain leads, as the current in the third lead is 8.66 a with a 5-amp. secondary current transformer.



The vector diagram representing these conditions is given above, where the equivalent primary currents are shown as 1, 2, 3 and the secondary currents *a*, *b*, *c*.

This will modify all the other diagrams (figs. 3 to 8) and possibly the conclusions of "W." as to the virtues of this connection.

The connection has been standard practice with the larger firms for 20 years, but it is significant that powerful supply companies specify 3 trip coils or 3 relays for earthed systems.

May 24th, 1924. S. R. M.

Wanted—a Guide to the Engineering Exhibits.

May I draw attention to what seems a serious defect at the Palace of Engineering, Wembley, namely, the absence of a booklet giving a block plan of the building, together with the names of the various exhibitors? The place is so vast that it is often impossible to discover the stands of particular exhibitors. Consequently, a large amount of one's time is wasted in walking up and down the avenues and being distracted by other exhibits. If such a booklet also contained an index of the firms exhibiting, along with a reference to their principal manufactures, it would be of considerable assistance to a visitor wishing to make the best of a day devoted to that section of the Exhibition. To avoid confusion of programmes, such booklets could be on sale only at the entrances to the Palace of Engineering.

Edward Hughes.

Technical College, Brighton,
May 26th, 1924.

[We heartily sympathise with our correspondent. We have met with precisely the same difficulty; moreover, it is not easy to find the office of the official publishers, where the catalogue may be obtained. Visitors, however, are welcomed on the ELECTRICAL REVIEW stand, which is near the power station; there they will be able to consult the catalogue and a large plan of the Palace of Engineering.—EDS. ELEC. REV.]

Business Notes.

Notice to Advertisers.—In view of the approach of the Whitsuntide holidays, our Advertisement Department wishes to draw attention to the arrangement under which new copy and alterations to existing advertisements must reach the ELECTRICAL REVIEW offices, 4, Ludgate Hill, London, E.C.4, by the Thursday morning in the week preceding publication.

Bankruptcy Proceedings.—KELSALL BROS. (Leonard Kelsall and Harold Kelsall), electrical engineers, Castle Place, Maison Dieu Road, Dover.—The first meeting of creditors was held on May 20th at the London Bankruptcy Court under this failure.

Mr. A. HAROLD WARD, the Canterbury Official Receiver, reported that a statement of affairs had been lodged showing liabilities £3,196, against assets valued at £616. It appeared from the debtors' statements that they purchased the above business as a going concern in May, 1920, for £1,390, and had since carried it on in equal partnership. Neither of them appeared to have possessed any capital, but the purchase money was advanced by their bankers upon the personal guarantee of a relative. Both the debtors had served an apprenticeship as electricians, and Mr. Leonard Kelsall had been in employment for some years as the assistant manager of an electric tramway company in the West of England. The business consisted mainly in the installation of electric light in private dwelling-houses and shops, but the debtors had also on some occasions undertaken the installation of wireless sets. Their largest contract was for the installation of electric lighting in 100 houses at Dover in 1921, at the price of £1,200, which work was stated to have been completed at a profit. They became aware of their insolvency about 12 months ago, but continued the business in the hope that the proposed extensions of colliery and railway works in Dover and the neighbourhood would increase their trade. The debtors attributed their failure to want of capital, competition, general trade depression, and a diminishing turnover. The trouble in this case, added the Official Receiver, was that the debtors had throughout traded with borrowed capital. He had been through the bank-book and found that the overdraft stood at four figures ever since the start, and that the bank charges amounted to £453. The debtors were in hopes of selling the business as a going concern, and certainly there was every hope of so doing, having regard to the development of coal in the neighbourhood. The Shell Co. was making Dover its oil station, having taken over the whole installation from the Admiralty.

In the absence of any offer, the creditors appointed Mr. A. W. Whistler, accountant, 15, Bench Street, Dover, as trustee to administer the estate in bankruptcy, with the assistance of a committee of inspection consisting of representatives of the Sloan Electrical Co., Ltd.; Edison Swan Electric Co., Ltd.; Super Electrical Co., Ltd., creditors for £299, £89, and £74 respectively. The bond to be given by the trustee was fixed at £500.

HENRY GARDE, manufacturer of electrical accessories, 28, Victoria Street, Westminster, S.W.—A sitting of the London Bankruptcy Court was held on May 23rd before Mr. Reginald Francke for the public examination of this debtor, who failed on 1st February with total liabilities, £4,969 (unsecured £3,369) and assets consisting of two contracts, realisable value uncertain, and two book debts, £1 1s. The debtor carried on business as an accountant from 1894 until 1902, and then commenced business as a petrol gas plant manufacturer at the above address; he discontinued that business in 1910, and had since carried on that of a manufacturer of electrical accessories. He attributed his insolvency to lack of capital, liability for £1,700 as surety, heavy interest on borrowed money, and to his inability to obtain goods necessary for the execution of orders in hand. The examination was concluded.

The following are the principal creditors:—

Unsecured:—	£		£
Andrews, G. A.	321	N. Shaffer	230
Bedford Coleman, Ltd.	246	H. Sloog	40
Brinsley, Ltd.	81	Stuart & Stuart	28
Cheadle & Waltho, Ltd.... ...	25	Taylor, Tunnicliff & Co., Ltd.	270
Chinn, F., & Co.	250	A. A. Thornton	55
Elliott, E.	150	W. H. Whadcoal	150
Fender, Herbert, & Co.	15	St. James' & Pall Mall Electric	
Fitzgibbon & Murray, Ltd. ...	40	Light Co.	14
D. Gilson & Co., Ltd.	90	L. Hun, Ltd.	161
A. E. Goodbody	370	Fully secured creditors ...	1,330
Jacobs Bros	98		
McDunn & Co., Ltd.	100	Partly secured creditors—	
E. Maxim & Son	18	T. H. Dey (secured £100) ...	175
Midland Bank, Ltd.	14	M. E. Richardson (secured £170)	770

C. J. COX (C. J. Cox & Co.), electrical and automobile engineers, Pontefract Road, Castleford.—Last day for proofs for dividend, May 31st. Trustee, Mr. W. Tate, 9, Central Bank Chambers, Leeds.

W. N. BERRY, lately carrying on business with H. Bamber as W. N. Berry & Co., electrical engineers, 32, Queen Street, Manchester.—Application for discharge to be heard on June 30th at the Court House, Manchester.

F. A. PILBROW (H. & J. West), electrical engineer, 7b, Stoke Road, Gosport.—Trustee, Mr. C. Hoult, Official Receiver, 87, High Street, Portsmouth, released May 14th.

T. S. CARTWRIGHT (T. S. Cartwright & Co.), electrical contractor, 90, Wellington Street, Stockport.—Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester, released May 12th.

H. C. PERRY, electrical contractor, Birchfield Road, Headless Cross, Redditch.—Receiving order made May 20th on debtor's own petition.

R. SHEARD (R. Sheard & Co.), electrical engineer, 12, Market Street, Featherstone, York.—Receiving order made May 19th on debtor's own petition. First meeting, June 2nd at the Official Receiver's office, 21, King Street, Wakefield. Public examination, June 12th at the Court House, Wakefield.

A. T. WILLIAMS and W. J. BEVAN (Electrical and General Engineering Co.), electrical engineers, 49, Commercial Street, Aberdare.—First and final dividend of 7¼d. in the £, payable May 30th at the Official Receiver's office, 34, Park Place, Cardiff.

J. H. WHITEHOUSE, electrical engineer, 61, Martin Street, Morriston, Swansea.—Supplemental dividend of ¼d. in the £, payable at the Official Receiver's offices, Government Buildings, St. Mary Street, Swansea.

Company Liquidations.—STRODE & CO., LTD., electrical engineers, Osnaburgh Street, London, N.W., and St. Paul's Churchyard, London, E.C.—A largely attended meeting of the creditors of the above was held on May 23rd at the Institute of Chartered Accountants, Moorgate Place, E.C., when Mr. H. Merrin, of Messrs. Matthews & Yates, one of the largest creditors, was elected to the chair.

No statement of affairs was circulated, but Mr. W. G. Jefferys, C.A., of 66, Coleman Street, E.C., reported that the liabilities to unsecured creditors totalled £16,659. The assets were set down at £30,128, from which had to be deducted £1,431 for preferential claims and £22,056 due on debentures. The net assets, therefore, were £6,642. The assets consisted of cash at bank, £348; stock estimated on the basis of a going concern, £3,842; plant, machinery and tools as a going concern, £1,600; office furniture and fittings, £100; investments £726, estimated to realise £80; motor car, £200; and book debts, £23,959. The goodwill stood in the books of the company at £6,000, but no value was placed upon it at the moment. As to whether there was any value in the goodwill depended largely upon the possibilities of a reconstruction. The book debts included an amount of £12,661 due from Messrs. Strode, whilst the ordinary book debts were £9,832. The latter were expected to produce £6,527. There was work in progress on uncompleted contracts which was valued at £4,770. Those contracts would require not less than £5,000 to complete. Negotiations had been entered into which would allow of the contracts being financed. If the contracts were not completed claims for breach might arise. The lease of the St. Paul's Churchyard premises was not considered of any value at the moment, and, in fact, it might be a liability.

The Chairman said he was sure that all the creditors were sorry to find the company in its present position. The business was an old-established one, and had been in existence for something like 120 years.

Mr. Jefferys reported that he had been appointed to act as receiver and manager for the first debenture-holders (the bank) and had also been nominated to act in a similar capacity for the second debenture-holders. He was also appointed as the liquidator in the voluntary liquidation. The first debentures were for £4,000 and carried interest at the rate of 6 per cent. per annum. The second debentures bore interest at the rate of 5 per cent. per annum, and they totalled £17,500. The interest accrued on the debentures was £556. There was a contingent liability from the company to the bank under an agreement dated October, 1920, in respect of a sum which was not to exceed £25,000. That money was to be advanced by the bank from time to time to Messrs. Strode, and he was satisfied that the liability could be wiped out as non-existent.

Mr. C. Wells, of the Wholesale Traders' Association, enquired who were the holders of the second debentures, and Mr. Jefferys replied that they were in the possession of a number of people, including members of the Strode family.

Mr. Ball, of Messrs. Saker & Davis, referred to the work in progress and inquired whether the company had received any payments on account.

Mr. Jefferys said that payments on account had been received on architects' certificates, and the figure appearing in the statement of affairs was the balance due after crediting the cash received. He added that in the short space of time at his disposal he had been unable to prepare any detailed history of the company's trading.

Mr. S. Tubbs, of Messrs. Dixon, Wilson, Tubbs & Co., asked if the debentures were issued for cash, and the liquidator replied in the affirmative. The debentures were issued years ago, and the money obtained was largely used in the rebuilding of the Osnaburgh Street premises.

Mr. W. Stammers, the solicitor to the liquidator, stated that the Osnaburgh Street premises were the cause of the present position. In 1913 the old lease of that property expired. A fresh lease was then entered into for a term of 80 years with the Commissioners of Woods and Forests, and there was an obligation on the part of the company to rebuild. The rebuilding was to cost £12,000, but the war intervened, and the result was that the rebuilding actually cost £36,000. That was the cause of the present position. The business was a very old-established one, and the present difficulties were caused by circumstances over which the directors had no control. The company had struggled against adversity, and it had to be remembered that conditions in the engineering trade had been bad. It had also been necessary for the company to cut prices. The rebuilding of the Osnaburgh Street premises involved the finding of large sums of money and the Strode family put up the cash required.

A creditor said he would like some further information regarding the Osnaburgh Street premises, and the chairman said he was informed that, although there was a contingent liability there of £25,000 to the bank, it could be regarded as non-existent. The income received from the building was £2,100 per annum. The building was probably an asset. He was also informed that as soon as the position of the company was ascertained, voluntary liquidation was decided upon. At the moment the company had contracts in hand to the extent of £15,662. They had also sent out estimates, which had not yet been accepted, to the extent of a further £31,729.

A creditor asked if any information could be given showing whether the contracts were profitable, and the chairman replied in the negative.

A creditor said that they were told that cut prices were one of the causes of the failure, but the chairman said that he did not understand that.

The Creditor: Yes, we were told that prices were cut so low that the profits were taken away.

The Chairman said it would be impossible to say what profits would accrue on the £15,000 of work which was in hand.

Creditors asked, if they were going to cut prices, and [illegible] contracts were not profitable, what was the use of going [illegible]

Mr. Stammers said that they might appoint an advisa[illegible] committee to deal with that matter.

Mr. Wells asked when the company realised its positi[illegible] and whether any proceedings had been commenced [illegible] creditors.

Mr. Stammers answered that only two writs for sm[illegible] amounts had been issued, and they were settled at once. T[illegible] position of the company was realised last month, when t[illegible] position was explained by Mr. Jefferys.

Mr. Wells went on to state that he was representing [illegible] creditor who supplied goods to the value of approximat[illegible] £100 on April 26th and 29th. His clients considered th[illegible] the company must have known its position at that date.

The Chairman: Apparently the company did not know [illegible] position then.

Mr. Hyman Isaacs, who represented the landlord of the S[illegible] Paul's Churchyard premises, asked if the company had be[illegible] making profits during recent years.

The liquidator said that the company had sustained los[illegible] but they were small compared with the loss made in 19[illegible] In that year the loss exceeded £8,000. In 1922, there was [illegible] loss of £2,500; in 1921 a loss of £6,900, and in 1920 a loss [illegible] £2,800.

Mr. Stammers said that the suggestion was that the credi[illegible] should appoint a committee of three of their number to [illegible] with the present liquidator. He hoped, before many da[illegible] passed, to make some proposition to that committee. T[illegible] liquidator added that he proposed to call the committee [illegible] gether within a few days as it was thought that a proposit[illegible] could be submitted.

The Chairman said that the liquidator was anxious to ma[illegible] the most of the assets, and it would be advisable for a co[illegible] mittee of inspection to be appointed. That committee co[illegible] consider the winding-up of the company or the carrying on [illegible] the business.

The Chairman proposed a resolution confirming the vol[illegible] tary liquidation of the company with Mr. Jefferys as liq[illegible] dator, together with a committee of inspection consisting [illegible] the representatives of the National Radiator Compa[illegible] Messrs. Siemens Bros. & Co., Ltd., and Messrs. Matthews [illegible] Yates.

The representative of the Sun Electrical Co., Ltd., second[illegible] the resolution, which was carried unanimously, and it w[illegible] decided that the Chairman should make the necessary ap[illegible] cation to the Court for the appointment of the committee.

The principal creditors are :—

	£		£
Exors. of Mrs. A. L. Cumberbach	3,892	Watsham & Co.	[illegible]
National Radiator Co. ...	1,663	General Electric Co., Ltd. ...	[illegible]
Siemens Bros. & Co., Ltd. ...	622	Hartley & Sugden	[illegible]
Credenda Conduits, Ltd. ...	505	Elliott & Son	[illegible]
John Russell & Sons	454	Matthews & Yates	[illegible]
		Sun Electrical Co.	[illegible]

SEMCO, LTD.—A meeting of members is called for June 2[illegible] at the offices of Messrs. Darke, Robson and Batty, [illegible] Bishopsgate, E.C., to hear an account of the winding-up fr[illegible] the Liquidator, Mr. F. B. Darke.

SIMMONDS BROTHERS, LTD., electrical engineers, late New[illegible] Street, Holborn, London, W.C., and at Wandsworth, Lond[illegible] S.W.—Sir Harold Moore, of Messrs. Moore, Stephens & C[illegible] C.A., of 2, Gresham Buildings, E.C., who was appointed [illegible] Receiver by the bank, the debenture-holders, and also [illegible] Liquidator in the voluntary liquidation of the company, h[illegible] disposed of the assets for a sum sufficient to discharge t[illegible] claims of the debenture-holders in full. He has also declar[illegible] a first dividend at the rate of 15s. in the £ to the unsecur[illegible] creditors, who will eventually receive payment of their clai[illegible] in full. The electrical business has been reconstituted, [illegible] already announced in these pages, under the style of Si[illegible] monds & Stokes, Ltd.

A. PECKSTON, LTD., wholesale electrical factors and gene[illegible] merchants, Middlesbrough.—A meeting of creditors was h[illegible] on May 22nd. The appointment of Mr. N. L. Joy, of [illegible] Wilson Street, Middlesbrough, as liquidator was approve[illegible] An informal committee acting with him, consists of rep[illegible] sentatives of three creditors—Messrs. Warren Bros., H. [illegible] Sproates & Co., and A. Jones & Co. The company was inc[illegible] porated on April 3rd, 1922, with a nominal capital of £1,[illegible] in ordinary shares of £1 each. In July, 1923, the capital w[illegible] increased to £4,000. The issued capital is £1,000 in ful[illegible] paid ordinary shares, 800 shares being issued for cash [illegible] 100 shares issued to the vendor. A further 100 ordinary sha[illegible] was issued to Mr. Austin Peckston on July 19th, 1923, [illegible] services rendered. The first accounts of the company's tr[illegible] ing made up to January 31st, 1923, showed a net loss [illegible] £19. The accounts for the year ended January 31st, 19[illegible] show a net loss of £276. Since that date it is estimat[illegible] that a further heavy loss of £1,250 was sustained, due [illegible] a very pronounced fall in sales. The directors attribute t[illegible] failure of the company to shortage of working capital a[illegible] heavy depression towards the end of 1923 and during t[illegible] present year. As a result of the first, considerable sums w[illegible] lost through the company's being unable to take advanta[illegible] of substantial cash discounts. The stock carried had to [illegible] restricted, and as a result orders had to be refused ow[illegible] to inability to execute them. Efforts to raise fresh cap[illegible] were unsuccessful. There is a deficiency of £1,104 [illegible] creditors' account.

RADIO SUPPLIES, LTD., 234, High Holborn, London, W.C[illegible]

—Pursuant to Section 188 of the Companies (Consolidation) Act, 1908, a meeting of the creditors in this matter was held on May 23rd at the Holborn Restaurant, London, W.C., when the chair was occupied by Mr. W. Smiles, of Messrs. W. W. Smiles & Co., C.A., Norwich House, Southampton Street, Bloomsbury, W.C., who stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. A statement of affairs was submitted which disclosed liabilities of £2,832. The total assets were £603, from which had to be deducted £135 for preferential claims, leaving net assets of £468, or a deficiency of £2,364, subject to the costs of liquidation and realisation. Mr. Smiles reported that the company was formed in August, 1923, to acquire and take over the assets and liabilities of Radio Supplies. The vendors' consideration was to be satisfied by the issue of 2,000 fully-paid shares and £5,000 in cash. The company began to get short of capital, and in April last one of the directors issued a writ for salaries in arrear, and to evade this the company passed the usual resolutions for voluntary liquidation.

In reply to Mr. C. Latham, of 15, Eastcheap, the Liquidator said that the liabilities taken over amounted to £521. He added that no accounts had been prepared during the company's existence.

Mr. Houstoun, of Messrs. Corfield & Cripwell, asked how the deficiency was accounted for, and the Liquidator replied that no detailed deficiency account had been prepared, but it was mostly accounted for by loss on trading. The net loss from August to May was £1,432. In reply to another question the Liquidator said that the £1,000 set out in the statement of affairs as due to the vendors was the balance of the purchase money, which was payable in cash.

Mr. Latham said that it was hardly fair to the unsecured creditors if that claim was allowed to stand. He thought that the vendors might withdraw that claim.

Eventually it was decided to confirm the voluntary liquidation of the company, with Mr. Smiles as liquidator, while a committee of inspection, consisting of three of the principal creditors, was also appointed.

The following are the principal creditors:—

	£		£
Micro Electric Laboratories, Ltd.	237	The Sugden General Engraving Co.	26
G. M. Chrussachi	62	Day, Bertram & Co., Ltd.	22
The Holrose Manufacturing Co.	53	The Dubilier Condenser Co. (1921), Ltd.	20
General Electric Co., Ltd.	42	Saxonia Electric Wire Co., Ltd.	21
The "Maple" Engineering Co.	35	Carrington Manufacturing Co., Ltd.	19
Telegraph Condenser Co.	32	Geo. W. Beacon	15
L. McMichael, Ltd.	28		
W. E. Marson, Ltd.	27		

H. HAYDON & Co., LTD., 3, Welford Road, Leicester.—The winding-up order in this matter was made on April 25th. The statement of affairs shows liabilities of £3,440, while the assets, amounting to £890, are insufficient to meet the claims of the debenture holders of £1,200. The company's failure is attributed to heavy trading losses sustained in opening up a wireless department, and on four ordinary trade contracts, also lack of capital. It has been stated by one of the directors that an expert managed the wireless department for the first two months, and the company then purchased and advertised heavily. The manager left suddenly, and there was no one with adequate experience to take his place. Considerable expense was incurred in public demonstrations, advertising, and opening a branch in the London Road, which was given up on June 30th, 1923. The department was opened about three months previously.

PREMIER ACCUMULATOR CO., LTD.—The notice given on page 833 of our last issue of course related to the liquidation of the original Premier Accumulator Co., and not the Premier Accumulator Co. (1921), Ltd., which was formed in 1921 to take over the business of that company, and is "going strong" at 53, Victoria Street, S.W., and at Northampton.

ENGLISH RADIO CORPORATION, LTD.—Winding up voluntarily. Liquidator, Mr. A. H. Whalley, 12, South Parade, Leeds. Meeting of creditors, June 4th, at the offices of Messrs. Simpson & Curtis, City Chambers, Infirmary Street, Leeds. Particulars of claims to the liquidator by July 4th.

FILM COOLING TOWERS, LTD.—Winding up voluntarily. Liquidator, Mr. K. W. Branczik, 124, Chancery Lane, W.C. Meeting of creditors, June 5th, at the offices of Messrs. Tansley, Witt & Co., 5, Chancery Lane, W.C.

GRAY ELECTRICAL CO., LTD.—Winding up voluntarily. Liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

ADAMS SILENT BURGLAR ALARM CO., LTD.—Particulars of claims by June 30th to the liquidator, Mr. E. Shalless, 81, London Street, Greenwich, S.E.

PEERLESS FLASH LAMP CO., LTD.—A meeting of members is called for June 25th at Crown House, Aldwych, W.C., to hear an account of the winding-up from the liquidator, Mr. T. Wood.

SWANAGE ELECTRICITY SUPPLY CO., LTD.—A meeting of members is called for June 26th at 2, The Abbey Garden, Westminster, S.W., to hear an account of the winding-up from the liquidator, Mr. W. H. Topley.

Dissolutions of Partnership.—UNITED ELECTRIC CO., manufacturing electrical engineers, Low Well Works, Briggate, Shipley.—Mr. H. Wilkinson and Mr. C. Binns have dissolved partnership. Mr. Binns will attend to debts and continue the business under the same style.

CLAYTON & CHADWICK, electrical and mechanical engineers, 67, Wortley Lane, Leeds.—Mr. J. Clayton and Mr. R. Chadwick have dissolved partnership. Mr. Chadwick will attend to debts and continue the business.

Trade Announcements.—MESSRS. CROGGON & CO., LTD., have appointed Mr. A. F. Lord (late of Messrs. Lord and Pickard, Exeter) to look after their interests in the South-Western counties. Correspondence regarding electrical material should be addressed to him at "Claresholm," Yelverton, S. Devon.

MESSRS. L. G. HAWKINS & CO., LTD., have removed from Charing Cross Road to new premises situated at 30-35, Drury Lane, Kingsway, W.C.2. The premises, which occupy 12,000 sq. ft. of floor space, include showrooms and demonstration rooms equipped with lighting fixtures, vacuum cleaners, washers, and other labour-saving electrical appliances. Telephone: Regent 6537 (three lines); telegrams: "Elemechex, Westcent," London.

MR. J. MCKENZIE, electrical and wireless engineer, Birkenhead, has opened larger premises at 29, Grange Road West.

MESSRS. BRECKNELL, MUNRO & ROGERS, LTD., have opened a branch office at 94, Market Street, Manchester.

Mr. J. MARTIN BLAIR, M.I.E.E., of Amberley House, Norfolk Street, Strand, London, W.C.2, has been appointed British representative of the Ramie Union, Enschede, Holland, makers of refractory materials for formers for electric radiators, furnaces, &c.

The ELECTRO-DYNAMIC CONSTRUCTION CO. has appointed the following representatives:—Messrs. Chas. F. Quicke & Co., 315, Euston Road, N.W.1, for the London District, and Mr. F. C. Pickard, 7, Bedford Circus, Exeter, for Hampshire, Wiltshire, Dorset, &c.

MR. H. G. OSBORN, late proprietor of H. G. Osborn, Ltd., is resigning his position with the General Accessories Co., Ltd. His address is 31, Princes Park Avenue, Golder's Green, N.W.11.

The address of the MINOTAUR POTTERY CO. is now Walker Street Works, Tunstall, Stoke-on-Trent, and all correspondence should be addressed there.

Catalogues and Lists.—MESSRS. GAMBRELL BROS., LTD., 76, Victoria Street, S.W.1.—An illustrated pamphlet describing "Efficiency" inductances for radio purposes.

THE PARSONS MOTOR CO., LTD., Town Quay Works, Southampton.—Publication No. 70, a catalogue of the firm's oil and petrol engines for marine and stationary work. Special attention is paid to export business.

MESSRS. MCWHIRTER & SONS, LTD., Central Electrical Works, Wharf Street, Cardiff.—A pamphlet advertising the company's electrical and engineering repair service, and agencies for electrical equipment.

MESSRS. RYLANCE & SONS, Mersey Works, Liverpool.—A series of pamphlets advertising marine glue, pitch, tar, bituminous compositions, oakum, &c.

MESSRS. BRECKNELL, MUNRO & ROGERS, LTD., Thrissell Street, Bristol.—An illustrated brochure dealing with the subject of electrical haulage in industrial works, &c.

SWITCHGEAR & COWANS, LTD., Elsinore Road, Old Trafford, Manchester.—Catalogue Sections Nos. 3 and 23, dealing respectively with mining-type switchgear and typical switchboard installations. Both are well illustrated.

THE STEAM FITTINGS CO., LTD., West Drayton, Middlesex.—An illustrated catalogue of the firm's manufactures, including steam traps, steam meters, oil separators, automatic temperature regulators, dial thermometers, &c.

THE "MONITOR" PATENT SAFETY DEVICES, Laburnum Avenue, Wallsend-on-Tyne.—A series of illustrated cards advertising safety appliances for air compressors, gas engines, turbines, electrical plant, &c.

MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham.—A pamphlet dealing with the company's policy in the electrical wholesale business. Also a wall sheet catalogue with illustrations and prices of "M.E.M." switchgear, &c.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Leaflet No. X3191, illustrating and describing "unit"-type switchboards. Fully priced details are given. Also Technical Description No. 220, illustrating a number of examples of these boards.

The Jugo-Slavian Market for Wireless Apparatus.—A report on the market for wireless receiving apparatus in Jugo-Slavia has been received in the Department of Overseas Trade from H.M. Consul at Zagreb (Mr. G. T. Maclean), copies of which may be obtained by firms interested in the sale of apparatus and accessories manufactured in the United Kingdom upon application to the Department, 35, Old Queen Street, London, S.W.1. (Reference No. B.X.1,010.)

Re-registration of Industrial Property Rights in Japan.—The Commercial Secretary at Tokio (Mr. G. B. Sansom) has written to the Department of Overseas Trade in London suggesting that the attention of British firms, likely to be concerned, should be drawn to the necessity of obtaining re-registration of patents, trade marks, &c., in Japan. He states that comparatively few British firms appear to have taken action in this matter, and points out that although applications for re-registration may be made at any time before October 31st next, it is important that manufacturers who had marks registered before the earthquake should instruct their original patent agents in Japan with regard to re-registration as early as possible.

Book Notices.—Messrs. Earle, Bourne & Co., Ltd., Heath Street South, Birmingham, have issued a souvenir booklet upon the occasion of their jubilee. This outlines the firm's history and contains numerous photographs of the works, directors, staff, &c.

"*Bulletin* of the Cleveland Scientific and Technical Institution." Vol. III, No. 7, April, 1924. Middlesbrough: The Institution.—This number contains abstracts of papers and articles on many branches of science and engineering.

Publications of the U.S. Bureau of Standards. Technologic Paper No. 251, "Equaliser Apparatus for Transverse Tests of Bricks" (10 cents); Circular No. 145, "Summary of Technical Methods for the Utilisation of Molasses" (15 cents); and Circular No. 163, "U.S. Government Specification for Titanium Pigment, Dry and Paste" (5 cents). Washington: Government Printing Office.

"Modern Power Engineering," by A. Regnauld, in four volumes, each of 250 pages, illustrated. London: Caxton Publishing Co., Ltd. Price 78s. complete.

Merchandise Marks Act.—The Federation of British Industries has been endeavouring for a considerable time to persuade successive governments to pass some measure which would permit orders to be made for the compulsory marking with the country of origin of foreign goods imported into Great Britain, with the object of enabling the British public to distinguish goods of foreign manufacture and give them the opportunity of buying British articles, if they prefer to do so. The terms of the present Merchandise Marks Act are insufficient for this purpose. With this end in view, the F.B.I. together with the Association of British Chambers of Commerce, last year submitted to the late Government agreed suggestions as to the form of such a Bill, which it was hoped that the Government, had it remained in office, would have introduced in due course. After the General Election the matter was again brought to the notice of the Board of Trade, which replied that it was not satisfied that there would be sufficient unanimity in this matter to enable a Bill to pass into law as an agreed measure. The F.B.I. last week sent a letter to the Board of Trade in reply, expressing surprise at the Board's statement as to lack of sufficient unanimity and holding that, since the sole object of the proposal is to assist the British consumer to know when he is offered foreign goods, there can be no reasonable objection on any ground of principle. The letter also contains detailed suggestions with regard to the setting up of a tribunal, somewhat analogous to the Railway Rates Tribunal, which should be empowered to insist on the proper marking of imported goods in any cases where the Tribunal considers the public interest would be served by having this done.

Sydney Electrical Contracts.—We quote the following report with reference to contracts for the Sydney City Council from the *Industrial Australian and Mining Standard* for April 3rd just to hand:—"At the last meeting of the Sydney City Council it was decided that for the present no tender would be accepted from any of the five firms concerned in the inquiry now being conducted by a special committee of aldermen into admissions that they added certain amounts to their tenders for electrical appliances for the purpose of dividing the amount amongst the unsuccessful tenderers. The Council then decided that the lowest tender, apart from the tenders of the firms concerned, should be accepted. This action involved an extra expenditure of £6,480. When placing the matter of the purchase of switchgear before a subsequent meeting of the Electricity Supply Committee, the Lord Mayor stated:—'At the last meeting of the City Council it was decided to accept a tender for the supply of ironclad switchgear which was not the lowest tender. The reason for this was that the English Electric Co. was the lowest tenderer, and the City Council, in face of certain admissions made at an inquiry, did not feel disposed, until further explanation was forthcoming, to have further trading relations with that company. The English Electric Co. are agents for A. Reyrolle & Co., of Hebburn-on-Tyne, England, and were purchasing the ironclad switchgear offered from that firm, subject to a commission to be paid to their agents.' The Lord Mayor continued: 'The representative of Reyrolle & Co. (Mr. C. Gallop) called on me and brought with him the agreement between Reyrolle & Co. and the English Electric Co. He informed me that for three years they had been trying to get in touch with the City Council, and now that they had an opportunity of securing a contract for £12,927 they were prevented by the unfortunate position that had arisen. The contract shows that A. Reyrolle and Co. can supply direct to the City Council, independently of the English Electric Co., but the latter can claim commission. Mr. Gallop stated that he thought he could guarantee that no such commission would be paid to the English Electric Co. By excluding the English Electric Co. and accepting the tender of A. Reyrolle & Co. direct the Council would effect a saving of £6,480, and if the latter firm would give a guarantee not to pay commission to the English Electric Co. there would be no breach of the intention of the City Council not to allow trading with the English Electric Co.' After a prolonged debate, it was agreed, by seven votes to two, to recommend the City Council to adopt the recommendation of the Lord Mayor."

The matter is also reported in the *Sydney Daily Guardian*, a copy of which has been sent to us. This paper adds:—"In the tenders for low-tension oil switch transformer panels, the lowest quotation was from the Australian General Electric Co., and the next lowest from Metropolitan-Vickers Electrical Co., Ltd. Both firms are concerned in the recent inquiry. The tenders of both were excluded, and that of Johnson and Phillips, Ltd., for £1,125, was recommended for acceptance. The successful tender was only £33 higher than the Australian General Electric Co.'s price. It is believed that in order to avoid trading with the firms concerned in the inquiry, several aldermen propose sending a representative of the Council abroad to buy apparatus direct in the home market."

Tramway Employes' Wages.—On Wednesday last a meeting of the Joint Industrial Council for the Tramway Industry was held for the purpose of considering an application for increased wages from the Transport and General Workers' Union. The claim is for a 10 per cent. increase in the case of men employed by undertakings outside the London area; stabilisation of the revised wages for a definite period; and the payment of time and a quarter for night work. The grading of systems of employés is also involved; it is proposed to reduce the number of grades of employés considerably, and to classify undertakings in four groups.

Rectifiers for Battery Charging.—We have received from the Carpax Company, Ltd., of Manchester, particulars of tests carried out by the Bureau of Standards, Washington, U.S.A., on 16 makes of rectifiers of the kinds used for charging the batteries of radio sets. From the performance curves it appears that "bulb rectifiers" have an efficiency ranging between 18 and 23 per cent.; vibrating rectifiers, between 31 and 45 per cent., rising to a maximum of 48 per cent.; and the tantalum rectifier, a maximum efficiency of 33 per cent. The "Homcharger," which is sold by the Carpax Company, is stated to have an average efficiency of 46 per cent., and extracts from the report are given showing that this rectifier operated satisfactorily at all times and was fitted with a meter that was more accurate than the instrument on any other of the rectifiers tested. The company is about to introduce a small rectifier at a lower price than that of the "Homcharger."

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections to any of the proposed marks may be entered within one month from the dates mentioned.

Mazda. No. 446,483. Class 8. Thermionic Valves.—The British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. May 14th, 1924.

Micadon. No. 447,014. All goods in Class 8.—The Dubilier Condenser Co. (1921), Ltd., Ducon Works, Goldhawk Road, London, W.12. May 14th, 1924.

Sterling Baby (lettering and design). No. 445,462. All goods in Class 8.—Sterling Telephone and Electric Co., Ltd., 210-212, Tottenham Court Road, London, W.C.1. May 14th, 1924.

W. H. M. Co. No. 432,257. Class 13.—Electrical conduit fittings, electrical junction boxes, and electrical switch boxes. The Walsall Hardware Manufacturing Co., Ltd., Walsall. May 14th, 1924.

W. J. (lettering and design). No. 442,258. Class 13.—Switches (ordinary), baseplates for electric gear and switch boxes, all being electrical metal goods. Witton-James, Ltd., The Hyde Electrical Works, Colindale Avenue, Hendon, N.W.9. May 14th, 1924.

Electricity Supply Workers' Wages.—As recently reported in our columns, an application has been before the National Joint Industrial Council for the Electricity Supply Industry for a general advance of 10s. per week in the wages of manual employés in electricity supply undertakings. Although the employers' side of the National Council felt that no case had been made out on behalf of the workers, it urged that arbitration should be resorted to, particularly in view of the strong recommendation to that effect at the recent Court of Inquiry for the tramway industry, and of the great importance of public utility undertakings. The employers agreed to abide by the decision of the Court of Arbitration. The employer-members of the North-West Midlands District Council are in entire agreement with this, and contend that there is no justification for strike action until constitutional procedure has been exhausted.

Engineering Employers and the Unions.—The conference between representatives of the Engineering Employers' Federation and the engineering trade unions was resumed on May 22nd. Several union delegates replied to the points raised by Sir Allan Smith at the previous meeting, and a request was made for a conference to consider the application for increased wages recently presented to the employers. This increase amounts to £1 a week for skilled men and smaller increments for unskilled workers. The employers agreed to this course, and the suggested conference is to be held on June 5th.

American Electrical Exports.—*Commerce Reports* states that the preliminary figures for March again show the steady advance which American electrical manufacturers are making in the sale of their products in foreign markets. Shipments of electrical goods valued at $7,564,465 were made during the month—a gain of more than $1,200,000 over March, 1923. The increase in electrical exports is distributed over practically all classes, insulated wire and cables being the only items in which shipments were appreciably lower than during March, 1923. The heaviest gains were in storage batteries, radio apparatus, transformers, and all sizes of motors.

Deed of Assignment.—YARNALL, BERTRAM AMOS (Yarnall and Co.), metal merchants, West Gorton, Manchester.—A statement of affairs was recently submitted to a meeting of creditors. Trustee: Mr. F. S. Burman, 29, Princess Street, Manchester, with the three principal trade creditors as a committee of inspection. Debts and liabilities, £5,394; property and assets estimated to realise £4,506, less preferential creditors £128; estimated deficiency, £1,016.

Unemployment.—A decrease of 14,560 in the total registered unemployed occurred during the week ended May 12th, the total being 1,026,100. The decrease since the commencement of the year now amounts to 259,500.

Steam Turbine Manufacture in Russia.—The Russian Leningrad Iron and Steel Works are delivering the first steam turbine manufactured at the works since the revolution. This turbine, which was ordered for the Omsk electrical station, is said to have given excellent results at the trials.—*Reuter's Trade Service* (Moscow).

Import Concessions in Paraguay.—The *Board of Trade Journal* states that a Decree dated March 27th permits the duty-free importation of specified quantities of certain material and plant for the electricity works at Encarnacion, including wire, electric meters and their accessories, insulators, electric lamps, switches, emery paper, paints and worked iron for lamp standards, asbestos, packings, klingerite, &c., electric motors and spare parts for machinery and tools of all kinds. Particulars as to the quantities of the articles which will be admitted free of duty may be obtained on application to the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Southern Railway Electrification. — Messrs. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., have received an order from the Southern Railway Company in connection with the electrification of its South-Western suburban lines between Raynes Park, Epsom, Leatherhead, Effingham Junction, Clandon, Guildford, Dorking, Hampton Court and Oxshott. The total length of cable involved amounts to more than 60 miles, and the cables are .2 sq. in., .15 sq. in., .1 sq. in., .06 sq. in. extra-high-pressure 3-core, paper-insulated, lead-covered and single wire armoured for a working pressure of 11,000 volts. The contract is for the supply, jointing and connecting up of the cables, and Messrs. Henley's are responsible for the supervision of their laying and installation. On the greater part of the route the cables will be run on iron "J" hangers erected on concrete posts, and on the remainder of the route they are to be laid solid in asphalt troughing.

Other important contracts which this company has carried out in connection with railway electrification are:—

London and North-Western Railway (now London, Midland and Scottish Railway), which involved the installation of over 20 miles 1.0 sq. in. or 1.25 sq. in. cables.

Central Argentine Railway, which included the supply and complete erection of about 68 km. (approximately 42 miles) of 20,000-volt 3-core cable and over 100 km. (approximately 62 miles) low-pressure, pilot, and telephone cables.

Buenos Aires Western Railway, which involved the supply and complete erection of about 125 km. (approximately 78 miles) of 20,000-volt 3-core cables and over 125 km. of low-pressure, pilot, and telephone cables.

Lancashire and Yorkshire Railway (now London, Midland and Scottish Railway), which included the supply of 13,000 yards of 3-core 19/14 shaped conductor 10,000-volt cable.

British Empire Exhibition Notes.—Conferences of engineering societies, embracing eight local societies, the Institute of Marine Engineers, and the Women's Engineering Society, are being arranged by Mr. A. S. E. Ackermann, secretary of the Society of Engineers, with the object of reading and discussing short engineering papers during the morning of each day, while the afternoon will be devoted to independent inspection of the Exhibition and enjoying its amenities. The first conference is to take place on Friday, June 6th, and the second on Monday, September 15th. On each occasion the session will last from 10.30 a.m. to 1 p.m., and will be followed by lunch and tea, and possibly dinner (optional). Tickets for either conference can be obtained from the Secretary of the Society of Engineers, 17, Victoria Street, Westminster, S.W.1, the charge being 5s. 6d. inclusive of admission, lunch, and tea. Applications for June 6th should be made at once.

The Fellowship of the British Empire Exhibition and the Oversea Settlement Committee have issued, jointly, an interesting booklet telling the story of the frieze in the Oversea Settlement Gallery and containing many pictorial comparisons of population, area, exports, imports, and other matters relating to the United Kingdom, the Dominions, and foreign countries.

Plans for the distribution of the F.B.E.E. Scholarship Fund are now being drawn up, and an appeal is made for sums between £100 and £1,000 for this purpose.

The number of people who visited the Exhibition on Saturday last (May 24th) was 139,550. The previous largest number was 128,945 on the previous Saturday.

For Sale.—Messrs. Geo. Cohen & Armstrong Disposal Corporation invite offers for a large quantity of underground electric cable laid about 1916-17 and recovered at H.M. factory, Gretna. (See our advertisement pages to-day.)

Trade Conditions in South Africa.—The general managers of the Standard Bank of South Africa report as follows regarding trade conditions in South Africa:—The uncertainty of the political situation is having an unsettling effect on business and, while the foundation is sound, insolvencies are still much too numerous. The electrical trades are active, and the engineering trades report fairly satisfactory returns. Business in mining material and machinery is moderately good, and tendering shows an increase. The electrical goods business is fairly satisfactory and prices are unchanged.—*Reuter's Trade Service* (Cape Town).

Australian Anti-Dumping Action.—The Sydney *Daily Telegraph* on March 11th published the following:—"It is not often that the anti-dumping law is made applicable to British manufactured goods, but one such is notified in last week's Commonwealth Government *Gazette*. A complaint has been made that certain British electric appliances known as knife switches and ironclad cut-outs were sold to an Australian importer at an export price less than the fair market value at time of shipment. The allegation having been substantiated by the Tariff Board, the anti-dumping duties have been made applicable to the goods as from December 8th last."

Institute of Industrial Welfare Workers.—The Institute of Industrial Welfare Workers was registered on May 16th as a company limited by guarantee and not having a share capital, with an unlimited number of members. The objects are: To initiate, promote, encourage, and co-ordinate the study of industrial welfare work in all its branches, and to adopt an agreement with the Welfare Workers' Institute. The management is vested in a Council, the first members of which are representative of all classes of interests.

Lighting and Power Notes.

Argentina.—The recently issued report of the Société d'Electricité de Rosario for the past year shows that the number of consumers increased from 27,294 to 29,810. The sales of electricity amounted to 33,135,967 kWh as against 28,962,792 kWh in 1922. In order to meet the increased demand for electricity the company is adding four new boilers and a 15,000-kW steam turbo-alternator to the generating station.

Australia.—NEW POWER STATION.—A report has been prepared by a Commission appointed by the Western Australian Government on the proposal to erect a power station on the Collier coalfield for the supply of electricity to the districts on the south-west coast. It is proposed to install plant with a capacity of 5,250 kW, at an estimated cost of £216,650.

Bingley.—ELECTRICITY EXTENSIONS.—The Urban District Council has decided to lay a h.p. cable for the supply of electricity to Cottingley, at an estimated cost of £2,242, and the clerk has been instructed to apply to the Electricity Commissioners for sanction to borrow the amount.

Calne.—SPECIAL ORDER.—The Rural District Council has consented to the application of the Western Electric Distributing Corporation for a Special Order authorising it to supply electricity within the whole of the rural district, except the parish of Calne Without.

Continental.—FRANCE.—Particulars are announced of a scheme for the electrification of 24 townships in the Department du Nord, including the erection of 70 km. of 15,000-V or 5,000-V lines, and 212 km. of l.p. lines, 36 transformer stations, standards, &c., the estimated outlay involved being 4,300,000 fr.

BELGIUM.—The new power station at Amay of the Société d'Electricité du Pays de Liege will be completed by the end of the summer. The demand for electricity is already greater than the capacity of the plant originally provided for and an order has been placed for an additional 7,200 kW set, which will bring the total capacity of the station up to 21,600 kW.

The Société de Gaz et Electricité du Hainaut, which has three generating stations in its district, has decided to erect a fourth station at Farciennes, in which two generating sets, each of 10,000-12,000 kW capacity, are to be at first installed.

Dutch East Indies.—WATER-POWER RESOURCES.—In his recent report on the economic situation of the Netherlands East Indies, the British Commercial Agent at Batavia states that the total water power available in the Netherlands East Indies amounts to 5,500,000 h.p., divided amongst the various islands, of which Java possesses 500,000, Sumatra 2,000,000, Borneo 2,000,000, and Celebes 1,000,000 h.p. Of this total only 60,000 or 70,000 h.p. has been exploited up to the present. In the above schedule New Guinea has not been included; the power available in this island alone amounts to 5,000,000 h.p. *Indian Engineering*.

Edinburgh.—NEW PLANT.—At a meeting of the Corporation on May 19th, the recommendation of the Electricity Committee that a 15,000 kW set be installed at the Portobello power

station was adopted. The cost of the extension is estimated at £157,000.

Glasgow.—ELECTRICITY SUPPLY.—It is proposed to install electric lighting in the sheds at Queen's Dock at the east end of Stobcross Quay. The capital cost of the scheme is estimated at £7,358, with an annual cost of £1,944. The Clyde Trustees have agreed to the plans.

Irish Free State.—PROPOSED RIVER LIFFEY TUNNEL.—At a recent meeting of the Dublin Port and Docks Board, the question of constructing a tunnel under the river Liffey, to carry electric cables, water mains, &c., was the subject of a report by the Board's engineer, who, in his statement, pointed out that to construct such a tunnel without accommodation for pedestrians would cost from £30,000 to £35,000, and that a tunnel with accommodation for pedestrian traffic would cost about £60,000. A Committee was appointed to consider the scheme.

DELGANY (CO. WICKLOW).—Mr. R. M. Butler, engineer to Rathdown No. 4 Rural District Council, has been instructed to prepare plans for the electric lighting of the town.

DUBLIN.—At a meeting of citizens at the Mansion House a resolution was passed authorising the Corporation to promote a Bill for the development of the water power of the River Liffey for the generation of electricity.

Liskeard.—ELECTRICITY SUPPLY.—After discussing applications from two sources for permission to supply electricity in the borough, the Town Council has decided to obtain further particulars from a Plymouth firm and to ascertain whether the applicants are prepared to commence operations in connection with the scheme forthwith.

Llandrindod Wells.—NEW PLANT.—The Urban District Council has received the sanction of the Electricity Commissioners to a loan of £1,600 for the provision of an oil engine at the electricity works.

London.—ST. PANCRAS.—The Borough Council has received the sanction of the Electricity Commissioners to the borrowing of £26,307 for converter plant, &c., and £7,320 for pulverised fuel plant in connection with two boilers at the King's Road station.

HAMMERSMITH.—The Electricity Committee has recommended to the Borough Council that the three-phase main from Wood Lane Arch to Scrubbs Lane sub-station be completed at an estimated cost of £15,557, and that additional sub-stations be erected and l.p. mains extended at an estimated cost of £8,320. It is also proposed to install an additional boiler at the power station at a cost of £20,000, and the Committee has recommended that the Electricity Commissioners be requested to appoint an electrical engineer to advise on the proposed extensions of the plant in the boiler house.

New Mills and Marple.—ELECTRICITY SUPPLY.—The Urban District Councils, which contemplate taking a supply of electricity from the Stockport Corporation, have decided to request Mr. Lomax, electrical engineer, to prepare a report showing the probable cost if each Council acted separately and the probable outlay for a joint scheme.

New Zealand.—ELECTRICITY SCHEME.—Messrs. Gauvain and McLeod have submitted a report on a proposed electricity scheme to the Kaipara Electric Power Board. It is recommended that a supply of electricity be obtained from the Horahora scheme at an estimated cost of £32,000. It is proposed to supply electricity to the town of Helensville, and a report is to be prepared showing the cost of the scheme.

Norwich.—NEW PLANT.—The Electricity Committee has submitted the following recommendations to the Town Council:—(*a*) That application be made to the Electricity Commissioners for sanction to a loan of £18,200 for the provision of converting plant, switchgear, &c., at the Duke Street power station; (*b*) that an order be placed for a 960-kW motor converter with the necessary cables and switchgear, at an estimated cost of £4,200; (*c*) and that arrangements be made for the installation of further converting plant, switchgear, &c., at an estimated cost of £14,000 as and when required.

Northampton.—EXTENSION OF SUPPLY.—The Northampton Electric Light & Power Co. has submitted a scheme to the Rural District Council for supplying electricity to the villages of Harpole and Kislingbury, by means of overhead wires, and the Council has approved of the principle of this method of supply.

Northern Ireland.—COOKSTOWN (CO. TYRONE).—A company has been formed to promote a public electric lighting scheme.

LONDONDERRY.—A series of industrial disputes has led to the closing down of the municipal electricity works and the cutting-off of the supply to all classes of consumers. When the electric power station workers were called out in sympathy with gravediggers and other strikers on wages issues, volunteers helped to provide a partial supply, but as the crisis developed boycotting of operating firms or firms associated with the volunteers began, and it was decided to close the works. It is hoped that a settlement of the various disputes will be effected through the intervention of the Northern Ireland Government.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

STRETFORD:—Lighting: From 5½d. to 5d. per kWh. Power, heating and cooking: From 1d. per kWh, plus 57½ per cent., to 1d. plus 45 per cent.

ELLAND:—Lighting: From 6d. to 5½d. per kWh. Cooking and heating: 1½d. per kWh.

SWINTON AND PENDLEBURY:—The percentage increase on the basic rate to be reduced from 60 to 50 per cent.

Sandbach.—ELECTRICITY SUPPLY.—A conference was recently held at Sandbach to consider the question of an electricity supply. Representatives from Alsager, Sandbach, and Whitchurch Urban District Councils, and the Congleton and Nantwich Rural Councils, were present. The application of the Gwynedd Trust, Ltd., for an Order was considered and it was decided that the Councils concerned should support the application.

Seaford.—ELECTRICITY SUPPLY.—The Urban District Council has decided not to carry out an electricity scheme for the district, but is in favour of a supply being introduced from outside the area. The services of Mr. Hawtayne have been retained to advise in connection with applicatjons that may be received from private companies and others for sanction to introduce an electricity supply.

South Africa.—CAPE TOWN.—The Electricity Commission is to erect a power station at Saltriver for the supply of electricity to the Cape, Suburban and Simonstown railway lines. The station will have an initial capacity of 30,000 kW and will cost £1,000,000.

At the recent Municipal Congress held in Cape Town, Mr. G. H. Swingler, City Electrical Engineer, in the course of an address, pointed out that in 1923 the Cape Town Municipality generated 11,225,212 kWh. or 57 per cent., more than in 1917, although 6,926 tons of coal less was used in 1923. The tariff also had now been considerably reduced—in fact, below the pre-war level—and the Municipality was still able to budget for a surplus of £30,800, of which £26,000 was for relief of rates. In 1912, 3,590 consumers were connected to the supply mains, as compared with 15,454 in 1923. The amount of energy sold in 1912 was 5,031,716 kWh. and in 1923, 23,606,005 kWh. From 1917 to 1923 £131,803 had been directly contributed to the relief of rates in addition to £406,308 being placed to depreciation and betterment accounts.

COLENSO.—A power station is to be erected at Colenso to provide electrical energy for the Glencoe and Maritzburg railway.

BEAUFORT WEST (CAPE PROVINCE).—The Railway Administration has notified the municipality that it is prepared to purchase electricity from the Municipality at 3¼ per kWh for a minimum bulk supply of 60,000 kWh per annum or 3d. per kWh for a bulk supply exceeding 72,000 kWh per annum. The offer has been referred to Mr. Adendorff, the Municipality's consulting engineer, who will submit it to the Electricity Commission.

Stevenage.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation an Order made by them authorising the Stevenage Electric Light & Power Co., Ltd., to supply electricity in the urban district of Stevenage and certain parishes in the rural district of Hitchin.

United States.—ELECTRICITY SCHEME.—The Adirondack Light & Power Co. has nearly completed the plans for the transmission of electrical energy between Boston and Detroit, a distance of approximately 800 miles. Lines of several other electrical corporations are involved. The direct interchange of electricity between Niagara Falls and Boston will be made possible by the construction of a thirty-mile high-pressure line between Syracuse and Oneida, which will connect the Niagara and New England producing fields for the first time and complete one of the longest transmission systems in the world. The lines of four electrical corporations in the East will be utilised on 500 miles of the project between Niagara Falls and Boston, making the Niagara energy available to east and north and connecting it with electrical developments in the Adirondack Mountains and New England steam plants. The necessity of reciprocity between steam and hydro-electrical development plants is said to be responsible for the present project for the interchange of power.—*Reuter's Trade Service* (Schenectady, N.Y.)

Worcester.—INAUGURATION OF EXTENSIONS.—The extensions of the electricity works, which are described in this issue, were formally inaugurated yesterday (Thursday).

Tramway and Railway Notes.

China.—HANKOW.—Certain Chinese capitalists propose to raise $2,000,000 and form a company for the operation of a tramway service in Hankow. The promoters will provide one half the capital and the other half will be raised from other sources.

Continental.—SPAIN.—The Sociedad Espanola de Industria y Traccion Electrica has recently been established for the construction of four electric railways, including a direct connection

between Madrid and the port of Valencia, as well as a line from the French frontier, *via* Madrid and Seville, to Algeciras. The company is said to represent foreign capital which is largely represented by a London banking house, and a committee has been appointed to examine the scheme, one member belonging to the Spanish Directory. In the meantime a new law has come into force for the protection of native industry, and a company which is to be regarded as a national one, must have a Spanish manager, Spanish capital to the extent of 75 per cent., and two-thirds of the directors and 50 per cent. of the employés must be Spanish.

Croydon.—TRAMWAY EXTENSIONS.—The Corporation is to extend the tramway depots and workshops, and to relay certain portions of the tramway track at an estimated cost of £105,000.

Darlington.—RAILLESS CARS.—A deputation, appointed by the Electricity and Light Railways Committee to visit Wolverhampton and Birmingham to study the railless-car systems in operation in these towns, has submitted a report in favour of the adoption of the system in Darlington, and the Committee has decided to recommend to the Town Council that railless cars be substituted for the existing tramway system. Mr. Baker, general manager of the Birmingham Corporation tramway undertaking, who has advised the Corporation on the proposed scheme, states that the estimated cost of the change over to railless cars is about £34,000.

India.—RAILWAY ELECTRIFICATION.—Proposals have been submitted by the South Indian Railway to the home board for electrifying the railway line from Madras Beach to Chingleput. The scheme put forward at present is to electrify the railway from Madras Beach to Thambaram in the first instance, and from Thambaram to Chingleput at a later date. In the proposed scheme it is recommended that the Madras Beach and Egmore route should have two lines, and the section from Madras-Egmore to Pallavaram should have three classes of traffic. It is, moreover, proposed to construct two new lines for the exclusive use of the electrified suburban passenger services, the existing main line to be retained for main line traffic. It is anticipated that the scheme will cost approximately Rs.360 lakhs.—*Financial News.*

London.—MOORGATE STREET STATION.—The two new escalators now being constructed at Moorgate Street, City and South London Railway Station will be completed and opened for traffic on Tuesday, July 1st. An entirely new station has been constructed below the road level, which will be able to deal with 10,000,000 passengers per annum.

NEW "UNDERGROUND" CARS.—Orders have been placed by the Underground Company for 127 new cars for service on the Edgware and City and South London and Morden lines. The new cars will be of a similar type to those now in use between Moorgate and Hendon and Highgate, and will bring the total number of cars of this design to 318.

Twickenham.—RAILLESS-CAR SCHEME ABANDONED.—The London United Tramways, Ltd., has abandoned the proposals regarding the running of railless vehicles in East Twickenham. —*The Times.*

United States.—NEW YORK.—The Interborough Rapid Transit Co., is making changes in the mechanical equipment of its elevated lines, which are expected to considerably reduce operating expenses. Under the new system, stopping and starting trains and opening and shutting gates will be accomplished automatically. There will be a guard in the first and the last car who will supervise the controls by a system of automatic signals.—*Reuter's Trade Service* (New York).

Telegraph and Telephone Notes.

Australia.—LOAN FUND GRANT.—The Commonwealth Postmaster-General is shortly to approach the Treasurer for an additional grant of £2,000,000 out of loan funds to meet expenditure in connection with the efforts being made by the Post Office to improve the telephone, telegraph, and postal systems. The above amount is in addition to £9,000,000 authorised by Parliament for a three years' programme of work.—*Reuter* (Melbourne).

Canada.—NEW RADIO STATIONS.—As has been previously explained, the Dominion Government is establishing a system of radio stations from the Yukon and the Arctic coast southward to connect with other telegraph systems at Edmonton. By this means the heavy cost of maintaining the wire-line in British Columbia, north of Hazelton, will be saved and the Mackenzie River valley from Fort Smith northward, for the first time, will have the benefit of wireless two-way communication with the rest of the world. Last season the first two stations in the series, those at Dawson and Mayo, were erected and have functioned satisfactorily. This spring work will be started on the station at Edmonton, which will be the southerly base of the system, and upon those at Simpson and Herschel Island as soon as navigation conditions permit the transportation of material. The Herschel Island station will be the most northerly in the system, being situated on the Arctic coast west of the Mackenzie River delta. The Canadian Corps of Signals will erect the three new stations. The approximate distances between the stations are: Herschel to Dawson, 385 miles; Dawson to Mayo, 113 miles; Mayo to Simpson, 468 miles; Simpson to Edmonton, 655 miles; a total of 1,621 miles.—*Natural Resources, Canada.*

Imperial Radio Communication.—A NEW CLAIM.—It is understood that important communications are proceeding between the Imperial Government and the Dominions with respect to the claims of the Marconi Co. that by means of short-wave beam, or directional, telegraphy, it is possible to send messages from this country to any part of the world at a cost of not more than one-tenth of the cost of working the contemplated Empire chain of stations. It is said that experiments have been made over a distance of 2,500 miles, but the company claims that there is no limit to the distance over which messages can be sent by inexpensive beam stations. A message from Melbourne, Australia, says that in the House of Representatives on the 22nd inst. Mr. Bruce stated that the whole position had radically changed in the last fortnight by reason of discoveries which might revolutionise the whole system of long-distance radio communication. He had cabled to the British Government, which had hitherto asked that no publicity should be given, for permission to publish the information.

The Associated Chambers of Commerce at Adelaide have affirmed the resolution on radio communication, which was passed by the Economic Conference. Mr. Paxton, ex-president of the Sydney Chamber, said that if a speedy termination of the dispute was not reached, Australia should ask for an opportunity to establish her own station in the United Kingdom.—*Daily Telegraph.*

India.—AUTOMATIC TELEPHONY.—According to the daily Press, the automatic telephone installation at Bombay was completed on May 17th.

Switzerland.—MARCONI SHARES.—It has been announced at Berne that in order to assure for the Swiss Confederation a majority of the shares in the Marconi station at Berne, the Federal Council has purchased 800 nominal 500-fr. shares hitherto held by the English company. It has further subscribed for 600 new shares in order to increase the capital to 2,200,000 fr. At present out of 4,200 shares the Swiss Government holds 2,200.—*Daily Telegraph.*

Transatlantic Radio Telephony.—BRITISH STATION.—A communication has been issued by the General Post Office dealing with the experiments which have been conducted on both sides of the Atlantic since 1915 with the object of linking the American and European telephone systems by wireless, which is impracticable with the existing types of submarine cable. Having outlined the earlier steps in this direction, the *communiqué* proceeds: Transmission of radio telephony has taken place weekly from the Long Island station, which has been received and measured in this country by the Post Office and by the Western Electric Co. In the January, 1923, demonstration a simple loop frame aerial was employed at the receiving end. A special receiving antenna was built by the Post Office, and tests showed that reception on it was more powerful and more free from atmospherics than on older systems. During the winter months, when conditions were favourable, speech was occasionally distributed during the day time over the land lines to a number of telephone subscribers at their homes in London and other parts of the country. The improvement gained was, therefore, the possibility of communication during certain hours when there is daylight in both countries, which under the previous reception conditions was in general unsatisfactory. The success of these one-way experiments has encouraged the Committee (Admiral Sir H. B. Jackson's) to recommend to the Postmaster-General the installation of an experimental 200-kW telephony valve transmitting plant at the new Post Office station at Rugby, of a similar type to that in use for the experiments in America, so as to enable two-way conversation to be carried on.

Radio Notes.

Canada.—NEW STATION.—Montreal will soon possess what is said to be one of the most powerful broadcasting stations in the world. It is C.K.A.C., owned and operated by the newspaper *La Presse*. The object of the station is to give "chats about French-Canada for French-Canadians," of whom there are about 2,500,000. In addition, there are 2,000,000 Frenchmen in the United States. Both English and French will be used in these talks, which will start at the beginning of June. A 7,000-watt three-phase rectification "All-Canadian-make" Marconi set will be used.—*Evening News.*

Germany.—INSURANCE.—Insurance circles are considering an increase of premiums for houses in which wireless installations have been erected owing to the alleged increased danger from lightning.—*Financial News.*

"Obstruction."—CASE DISMISSED.—Stanley H. Davies, of Westcliff, was summoned at Southend on May 20th for causing an obstruction by broadcasting from his premises the King's speech at Wembley on April 23rd. The Chief Constable said he warned Mr. Davies that he should not broadcast the speech. The case was dismissed, the Bench agreeing that the occasion was a unique one.—*Evening News.*

The Knutsford Urban Council has decided to forbid tenants of Council houses to erect radio aerials. Those that have aerials already fixed will be compelled to take them down.—*Newcastle Daily Journal.*

Paignton (Devon) Council has entered into an arrangement with Messrs. Sansom to provide radio apparatus for wireless entertainments on the sea front.

Educational Broadcasting.—COURSE OF LECTURES.—The British Broadcasting Co. is about to inaugurate a series of educational lectures and addresses which may be likened to a University Extension course, and to assist it the Board of Education has nominated one of its inspectors, Mr. J. C. Stobart, to become Director of Educational Broadcasting, and he will take up his new post in August. One series will be on health questions, under the supervision of the Ministry of Health.

PLYMOUTH SCHOOLS.—The Education Committee has resolved to invite Mr. S. G. Monk, chairman of the Plymouth Wireless Society, to assemble a receiving set at one of the elementary schools for demonstration before the members with a view to instruction being provided in the schools.

A deputation representing a large number of listeners was recently received at the Plymouth broadcasting station by Captain Eckersley, chief engineer of the British Broadcasting Co., in order to present complaints regarding the "tinny" quality of the transmission and the inconsistency of the signal strength. Following this interview a new aerial of the inverted L type has been erected, and is suspended between two high chimney stacks.

U.S.A.—RADIO TAX KILLED.—The Revenue Bill clause that was designed to impose a 10 per cent. tax on radio sets and parts was very unpopular, and floods of protests from individuals and associations all over the country have resulted in the proposal being abandoned.—*American Radio Journal.*

RADIO FAIR TESTS.—What is described as the Radio World's Fair, to be held in New York from September 26th to 28th, under the auspices of the Radio Manufacturers' Show Association, is attracting much attention, and larger space will probably have to be found to house the exhibits. Amongst the features introduced this season will be a "foreign division" and a prize competition for the most meritorious inventions developed in 1924. There will also be a series of transatlantic broadcasting tests, in which British broadcasting stations are invited to co-operate.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—June 30th. City Council. 100 single light units, complete with Goliath or Mogul sockets, for ornamental street lighting; 185 ditto, with standard Edison screw sockets; ten 2-light units, with standard Edison screw sockets.*

August 4th. State Electricity Commission. 66,000-V transformers. (May 23rd.)

NEWCASTLE (NEW SOUTH WALES).—June 12th. City Council. H.p. submarine cables and accessories.*

SYDNEY.—July 14th. Municipal Council. Voltage regulators.*

Bacup.—June 7th. Electric wiring at Mount Pleasant chapel, school, and manse. Specifications from Mr. Thomas Harker, Stoneleigh, Bacup.

Belgium.—June 3rd. The Diputation Permanente de la Province de Limbourg. Equipment of 20 transformer cabins in certain villages of the province. Particulars for 10 fr. from Service Provincial d'Electricité, 27, Avenue Bamps, Hasselt.

June 4th. Belgian Post and Telegraph authorities, at La Salle Madeleine, Brussels. Supply and laying of two lots of telephone cables and accessories, one lot in the Eupen district and the other at Hasselt. Particulars (Cahier des Charges Special No. 3-14) for 4 fr.

Bridgend.—June 11th. Urban District Council. Two 1,000-kW turbo-alternators and condensing plant; one 500-kW alternator and gearing. (See this issue.)

Brighouse.—Education Committee. Electric lighting installation at Victoria School. Form of tender, &c., from Mr. A. W. Hoyle, Director of Education.

Bristol.—June 9th. Docks Committee. Three 2-ton movable electric jib cranes. Mr. T. A. Peace, Chief Engineer's Office, Avonmouth Docks.

Derby.—Electricity Department. Two water-tube boilers, complete with economisers, draught plant, stokers, or alternatively for powdered fuel plant. (May 23rd.)

Edinburgh.—June 9th. Electricity Supply Committee, 33,000-V overhead main transmission line. (May 23rd.)

Fife.—LOCHGELLY.—June 7th. Burgh Council. Electric lighting installation (first instalment) of the Burgh Council's housing scheme. Mr. A. D. Haxton, architect, 3, High Street, Leven.

Irish Free State.—DUBLIN.—June 25th. Postmaster-General's Department. 50 tons h.d. copper wire; 7 tons bronze wire; 3,600 stay rods; and 25,000 spindles. (May 16th.)

London.—INDIA STORE DEPARTMENT.—June 20th. Lead sheathed, armoured, dry core cable. (See this issue.)

New Zealand.—TAIHAPE.—August 1st. Borough Council. Turbo-generator, pressure governor, and automatic weir for the Taihape hydro-electric station.*

WELLINGTON.—August 14th. City Council. One electrically-driven multi-stage turbine pump complete.

Plymouth.—June 12th. Electricity Department. C.I. pipes. (May 23rd.)

Scarborough.—June 18th. Board of Guardians. Installation of storage battery, 300-Ah capacity, complete, and booster set. Mr. J. W. Read, clerk to Board of Guardians, 14, Dean Row.

Southall.—June 10th. Southall-Norwood Urban District Council. Maintenance of the fire alarm system. (See this issue.)

South Shields.—June 4th. Electricity Supply Department. Two water-tube boilers with mechanical stokers, economisers, superheaters, and induced-draught plant and feed pumps. (May 16th.)

Uruguay.—MONTEVIDEO.—July 8th. State Electricity Works. Six 6,000/200-V, 3-phase transformers, l.p. switchboard and accessories.*

July 9th. Copper wire and cable.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Government Contracts.—The following Government contracts were placed during the month of April, 1924:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

Amplifiers.—India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
Transmitters and coils.—Radio Instruments, Ltd.

WAR OFFICE.

Crucibles.—Morgan Crucible Co., Ltd.
Installation of electric lighting at Mill Hill Barracks.—Alpha Electrical Manufacturing Co., Ltd.

POST OFFICE.

Telephone apparatus.—British L.M. Ericsson Manufacturing Co., Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Sterling Telephone & Electric Works, Ltd.; Western Electric Co., Ltd.
Cable.—Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Macintosh Cable Co., Ltd.; Union Cable Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Telephone cords.—Macintosh Cable Co., Ltd.
Meters.—Automatic Telephone Manufacturing Co., Ltd.; Western Electric Co., Ltd.
Distribution cable plugs.—Dugard Bros., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.
H.d. copper wire.—T. Bolton & Sons, Ltd.; Enfield Cable Works, Ltd.; Pirelli-General Cable Works, Ltd.; John Wilkes, Sons & Mapplebeck, Ltd.
Soft copper wire.—Enfield Cable Works, Ltd.
Annealed copper wire.—Elliotts Metal Co., Ltd.
Switchboard wire.—General Electric Co., Ltd.
Leclanché zinc rods.—Locke, Lancaster & W. W. & R. Johnson & Sons, Ltd.
Automatic mechanical stokers, Birmingham postal telegraph factory.—E. Bennis & Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Oxted-Westerham-Swansea-Port Talbot, Welwyn-Stevenage-Hitchin: Callender's Cable and Construction Co., Ltd. Pontypridd-Merthyr-Tydvil, Coventry-Rugby, Northampton-Wellingborough-Kettering, Gloucester-Cheltenham, Southampton-Bournemouth-Wareham: Western Electric Co., Ltd. Doncaster-Goole, Northwich-Crewe, Durham-Bishop Auckland, Birmingham-Tamworth, Darlington-Stockton-Middlesbrough and Stockton-West Hartlepool, Newcastle-Blyth: Siemens Bros. & Co., Ltd. Stirling-Inverkeithing, Glasgow-Motherwell-Hamilton-Wishaw-Carluke, Godstone-East Grinstead: Johnson & Phillips, Ltd. Wigan-Ormskirk, Manchester-Knutsford: W. T. Glover & Co. London-Cambridge: W. T. Henley's Telegraph Works Co., Ltd. Chester-Wrexham: British Insulated & Helsby Cables, Ltd.
Telephone exchange equipment, Manchester (Central).—General Electric Co., Ltd.; Messrs. Brown, Muff & Co., Ltd. (Bradford); Messrs. Morris Engines (Coventry), Ltd.; Messrs. Smiths Docks Co., Ltd. (North Shields); Relay Automatic Telephone Co., Ltd., Maryland, E.; Messrs. Dunlop Rubber Co. (Birmingham); Western Electric Co., Ltd.; Risca (Newport, Mon.); Automatic Telephone Manufacturing Co., Ltd.; Port of London Authority (head office), London & Katherine Docks, Victoria and Albert Docks, India and Millwall Docks. Surrey Commercial Docks and Tilbury Docks, Messrs. the Prudential Assurance Co., Ltd.: Siemens Bros. & Co., Ltd.
Telephone repeater station equipment.—Bristol: General Electric Co., Ltd. Wireless station power plant, Rugby: Newton Bros. (Derby), Ltd.

CROWN AGENTS FOR THE COLONIES.

Cable.—Siemens Bros. & Co., Ltd.; British Insulated & Helsby Cables, Ltd.
Generating plant.—Browett Lindley & Co., Ltd.
Radium applicators.—Watson & Sons, Ltd.
Steam turbine.—Fraser & Chalmers, Ltd.
Switchgear.—Metropolitan-Vickers Electrical Co., Ltd.
Telephone apparatus.—Western Electric Co., Ltd.

H.M. OFFICE OF WORKS.

Engineering services, Rampton State Institution, cables, lamp standards, &c.—Siemens Bros. & Co., Ltd.

(Continued on page 888.)

The Wembley Electricity Supply.—II.

The D.C. and Sub-station Installations.

DIRECT current for use in the exhibition is derived from two sources, namely, (i) the rotary converters in the a.c. power station sub-station already described,* and (ii) the following four sets of 220/440-volt generating plant in the Palace of Engineering:

(*a*) A horizontal tandem compound Paxman-Lentz, 130-r.p.m. reciprocating engine, fig. 1, by Messrs. Davey, Paxman & Co., Ltd., coupled direct to a 300-kW, d.c. generator, by the Electric Construction Co., Ltd. This set is supplied with steam at 170 lb. per sq. in. from the boiler house in the exhibition generating station, to which it is connected by a special steam main. A valve installation by Messrs. Sir W. H. Bailey & Son reduces the steam pressure from 220 to 170 lb. to suit this engine.

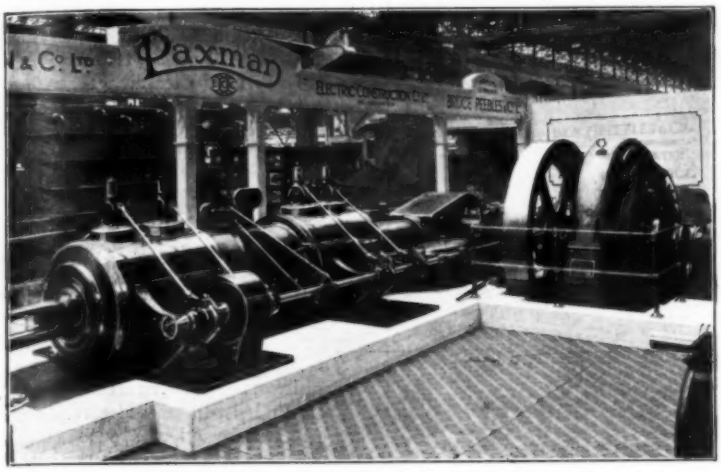


Fig. 1.—Paxman-E.C.C. Steam Generating Set.

(*b*) A twin, horizontal, crude-oil, 190-r.p.m. engine, by Messrs. Blackstone & Co., Ltd., coupled direct to a 180-kW, d.c. English Electric generator, as shown in fig. 2; the switchboard and air starting gear are to be seen on the left.

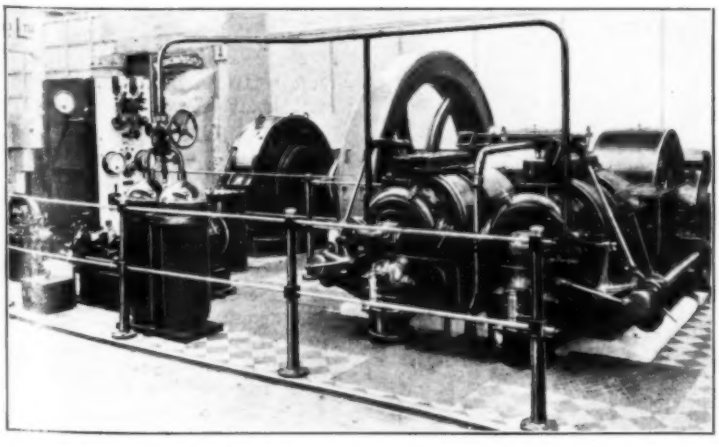


Fig. 2.—Blackstone-English Electric Oil Generating Set.

(*c*) A 4-cylinder, vertical, cold-starting 250-r.p.m. oil engine, by Messrs. Ruston and Hornsby, Ltd., driving direct a Crompton 250-kW generator. This set is illustrated in fig. 3 with the switchboard and air compressor to the right.

(*d*) A semi-stationary type of combined boiler-engine installation, complete with condensing and water-cooling plant, by Messrs. Richard Garrett & Sons, Ltd., driving direct a 175-kW, d.c. English Electric generator at a speed of 170 r.p.m. This engine is shown in fig. 4, and the small motor-driven draught fan can be seen on the gallery beside the chimney. A Keith fan is associated with the cooler, which is by Messrs. F. Smith & Co. (Elland), Ltd.

The above-mentioned generating sets have been installed by members of the British Engineers' Association, and operate as working exhibits on the makers' stands in the Palace of Engineering.

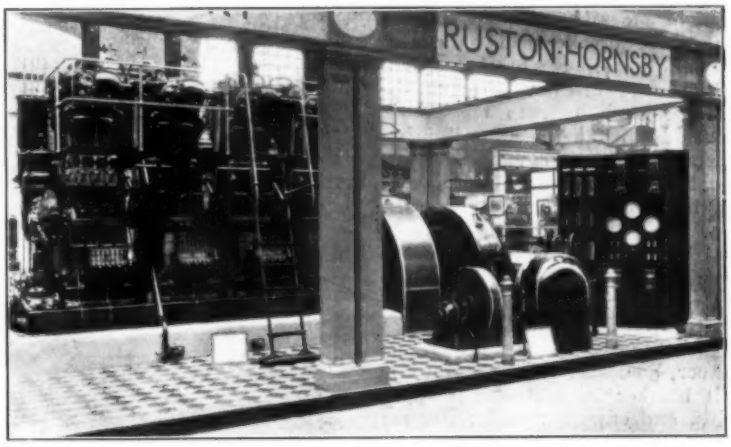


Fig. 3.—Ruston & Hornsby-Crompton Oil Generating Set.

The common distribution network is also fed by the main power station sub-station (see figs. 10 and 11, page 706, May 2nd), which contains two 500-kW, 3,300/440-volt rotary converters supplied by the British Thomson-Houston Co., Ltd., and the English Electric Co., Ltd. The e.h.p. starting panel for the former machine is of the totally-enclosed type, constructed of welded angle and sheet iron, and is fitted with a voltmeter for synchronising, a polarity indicator, sychronising lamps, field-reversing switch, &c. The actual starting device comprises triple-pole switches for the starting motor and main circuit, both operated by a common lever, of which the forward movement (which is in two steps) is for "starting" and "running," while the backward movement is only made when it is desired that the starting motor be used to

*ELEC. REV., May 2nd, 1924.

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run the rotary for cleaning, or for grinding the commutator or slip rings. A gate quadrant is fitted to prevent over-running the various positions. The start-

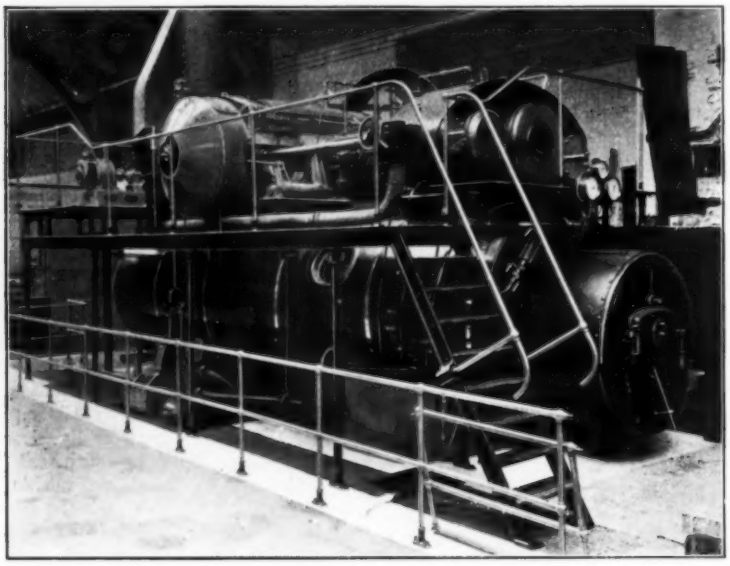

Fig. 4.—Garrett-English Electric Steam Generating Set.

ing lever and the main oil circuit breaker are interlocked to ensure that the starting lever must be brought to the "off" position before the breaker can be closed, and also to trip the breaker should the operator attempt to bring the starting lever back to the "off" position while the machine is being started or while it is running. The l.p. B.T.-H. switchboard consists of 17 black enamelled slate panels, four being for the control of 500-kVA transformer equipments, five for the 500-kVA feeders, and eight for the 200-kVA feeders. Each of the transformer panels has a set of isolating switches, current transformer, ammeter, voltmeter, oil circuit breaker with three protective trips, and current transformers for the B.T.-H. "circulating-current" protective equipment. The feeder panels are similarly equipped, with

Fig. 6.—No. 2. A.C. Sub-Station.

Fig. 5.—No. 3. A.C. Sub-Station.

the exception that they are fitted with a different pattern of oil circuit breaker, and no protective transformers are included. Each machine is fed from the main a.c. power station switchboard through a 3,300/320-volt, 3/6-phase transformer and starting pillar, producing 440/220-volt, 3-wire d.c.; the B.T.-H. set has a pony motor and Brush transformer, while the English Electric machine is tap started. Running in conjunction with these two sets is a 500-kW rotary converter on the stand of the General Electric Co., Ltd.

In addition, the power-house sub-station contains the following plant:—One 1,000-kVA, 11,000/3,300-volt, 3-phase transformer by the British Electric Transformer Co., Ltd., which interconnects the mains of the North Metropolitan Electric Power Supply Co. with the main Reyrolle switchboard in the Exhibition generating station. The unit is controlled on the e.h.p. side by means of a G.E.C. truck-type boiler-plate cubicle incorporating McColl balanced-current protective apparatus.

The British Electric Transformer Co., Ltd., the Brush Electrical Engineering Co., Ltd., Messrs. Ferranti, Ltd., and Messrs. Johnson and Phillips, Ltd., each supplied one 500-kVA transformer, which step down the generated pressure for general distribution. Their output is controlled by a 19-panel Allen West 415-volt, 4-wire, 3-phase switchboard of the protected iron-clad type equipped with loose-handle oil switches. The d.c. 3-wire, 440/220-volt distribution network is controlled by a Park Royal 8-panel switchboard that is fed by the two above-mentioned rotary converters and d.c. generators.

All the instruments on the main Reyrolle switchboard in the generating station were loaned by Messrs. Nalder Bros. & Thompson, Ltd., while the turbine lubricating oil purifiers are of the De Laval centrifugal type of Chadburn's (Ship) Telegraph Co., Ltd.

In addition to the plant already mentioned, a number of a.c. sub-stations are located in the exhibition buildings and about the grounds. The largest is the 2,000-kW sub-station in the Palace of Industry, wherein the

pressure of the incoming 3-phase, 50-cycle, 11,000-volt supply from the North Metropolitan Electric Supply Co. is reduced by four 500-kVA transformers to the distribution voltage. This installation has been specially equipped with B.T.-H. e.h.p. switchgear for controlling the two ends of a ring main as well as the interconnecting transformer in the exhibition generating station. The same board also controls a bank of four 11,000/415-volt, 500-kVA transformers in the adjoining No. 1 sub-station, the output of which is controlled by a 15-panel, l.p., a.c. George Ellison switchboard, of the protected ironclad type. In No. 1 sub-station there is also a special General Electric 415-volt, 4-wire, 3-phase board, arranged to supply a total of four feeders either from the North Metropolitan Co.'s, or the exhibition's supply systems.

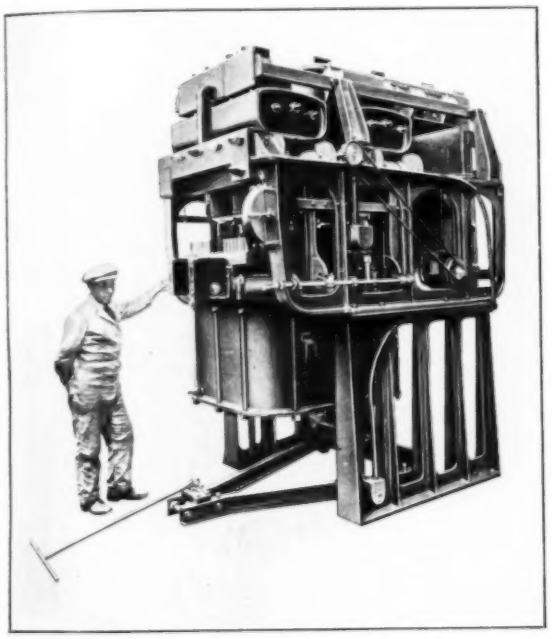

Fig. 75.—Ferguson, Pailin 300 A, 33,000-V, Triple-pole "Drop-down" Circuit Breaker, Type "HV3" (see p. 886).

In No. 2 sub-station is a 7-panel B.T.-H., manually-operated, totally-enclosed, truck-type, compound-filled switchboard, arranged to control the e.h.p. input from two 1,500-kVA feeders to four 500-kVA transformers of the Brush, Ferranti, Johnson & Phillips, and British Electric Transformer Co.'s manufacture. Their l.p. output is controlled by a 17-panel B.T.-H. switchboard of the direct-control back-of-panel type. This sub-station (fig. 6, p. 884) will also be furnished with a l.p. G.E.C. change-over board.

In the No. 3 sub-station is a 4-panel, truck-type, totally-enclosed, direct-control, ironclad Ferguson, Pailin switchboard, fed by two e.h.p. 1,000-kVA incoming feeders, which controls one Brush and one Johnson & Phillips 500-kVA transformers. The l.p. output is controlled by a General Electric 8-panel, direct-controlled, back-of-panel type of switchboard, feeding six 400-ampere outgoing feeders (fig. 5, p. 884).

The exhibition grounds are lighted by some 560 low concrete columns, each carrying a spherical glass globe lantern, designed by the exhibition architects, Messrs. Simpson & Ayrton. Each of these lanterns contains gas-filled lamps of 600 watts, and there are a number of high double-lamp metal standards. The exterior of the buildings are illuminated by flood lighting so arranged as to produce colour effects, which will be controlled from a separate sub-station fed by three 250-kW, 3-phase feeders at 415 volts from No. 2 sub-station. Each incoming feeder is connected to a switch pillar which controls the supply to one unit consisting of three single-phase Allen West liquid dimmers, one per phase. Each of the three sets of dimming equipment is capable of absorbing 40 per cent. of the line voltage at 250 kW (see p. 686, May 2nd, 1924).

To accommodate the distribution cables a complete duct system varying from 12 to 4 stoneware, 3½-in. ducts has been laid by the main contractors, Sir Robert McAlpine & Sons, the material having been supplied through the Cable Makers' Association. The cabling of the exhibition is divided as under:

(*a*) The main grounds; distribution in the Palaces of Engineering and Industry. The h.p. and e.h.p. cables supplied by the C.M.A. are of the paper-insulated, lead-covered, and wire-armoured type, while the 415-volt, 4-core cables for general distribution are also paper-insulated and lead-covered. The network is controlled by distribution pillars of standard type, of which between 50 and 60 are used.

(*b*) Amusements Park. The cables, by the Pirelli-General Cable Works, Ltd., for the main 415-volt, a.c. system are of the 4-core, paper-insulated, lead-covered type, either laid direct in clay or, alternatively, wire armoured; the network is controlled by distribution pillars by Messrs. W. Lucy & Co., Ltd. The direct-current cables are single-core, paper-insulated, lead-covered, and laid direct in the clay, or wire armoured.

The d.c., 3-wire supply, at 220/440 volts, is available in the Palace of Engineering, a section of the Amusements Park, and to one or two special users, such as the "Never-Stop" railway. A 3-phase, 3,300-volt supply is given to a limited number of exhibitors.

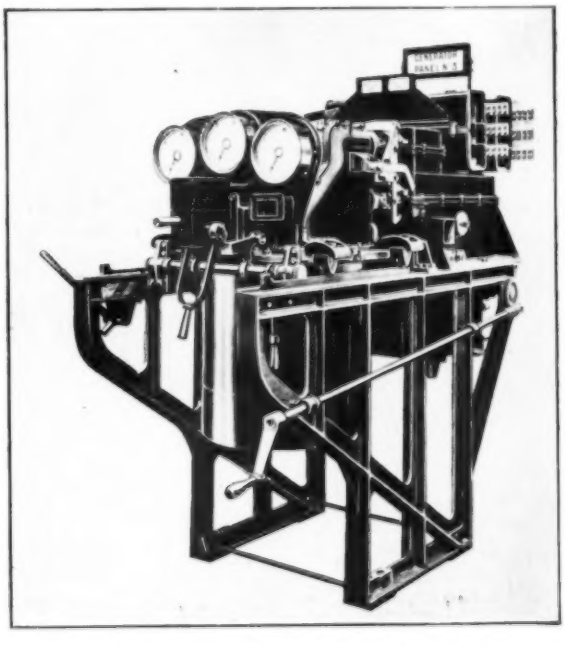

Fig. 76.—Ferguson, Pailin 300-A, 11,000-V, Triple-pole Draw-out Oil Circuit Breaker (see p. 886).

The supply serving the Imperial Stadium is derived from an independent sub-station that is fed from the North Metropolitan Electric Power Supply Co.'s mains; it is equipped with transformers of 150 kW.

The applications for power and light received up to the end of March, 1924, aggregated a total connected load of some 11,500 kW, approximately sub-divided as shown in the accompanying table:

Lighting of grounds and exterior of buildings, excluding Amusements Park	670 kW
Lighting of Palaces of Engineering and Industry; Conference Hall	400 kW
Lighting of principal restaurants	430 kW
Power and light for exhibitors in Palaces of Engineering and Industry	2,700 kW
"Never-Stop" railway	750 kW
Power and light for Amusements Park	1,200 kW
Power and light for Colonial and Government buildings	1,800 kW
Three-phase 3,300-volt supplies	2,200 kW
Miscellaneous supplies	1,350 kW

Some of the Exhibits at Wembley.

Messrs. Ferguson, Pailin, Ltd.

(Stand No. 51, Avenue 11, Bays 14 and 15.)

A great deal of heavy switchgear, including a number of new designs, is exhibited by this firm.

Among this is the 300-A, 33,000-V triple-pole "drop-down" oil circuit breaker illustrated in fig. 75, p. 885.

This unit has been designed for heavy duty in central stations and has a large rupturing capacity. It is specially suitable for duplicate bus-bar systems, and electrical remote control. The raising-and-lowering gear is driven by a reversible electric motor through bevel gears and a chain-and-sprocket drive. There are two sets of bus-bars and isolating plugs. The circuit breaker is, virtually, two breakers with a common set of three terminals which connect to the cable box. The remaining two sets of terminals connect to the two sets of bus-bars respectively. Normally, one breaker is "in" and the other "out." Only when used for bus-bar coupling are both breakers "in" together. The double breaker enables one breaker to be used as a stand-by for the other, in case there is insufficient time to inspect the arcing contacts after operating on a heavy fault. Each of the two breakers has its own system of operating levers, and each is fitted with its own closing solenoid, so that, normally, the selection of bus-bars is effected from the control board. Change-over is accomplished by the simple expedient of pressing push buttons. To prevent incorrect sequence of operation the unit is fully interlocked.

The armourclad, 330-A, 25,000-V, compound-filled unit, type "FV," shown, has been designed for heavy duty in central stations, and has a large rupturing capacity. The fixed portion, consisting of a single set of bus-bars, isolating plugs and cable box, is accommodated above the movable portion; the latter consists of an oil-immersed circuit breaker with isolating sockets. For raising or lowering the breaker, a manually-operated screw-lifting mechanism is supplied.

In the 300-A, 11,000-V "E.D.2" type oil circuit breaker exhibited (fig. 76, p. 885) two sets of bus-bars are provided, change-over being accomplished by an oil-immersed selector switch, which is mounted below the bus-bar chambers. The selector switch is manually operated, a mechanical indicating device being fitted to show to which set of bus-bars the breaker is connected. The unit may be used as a bus-bar selector and coupler, or as a bus-bar selector only; as consumer's main circuit breaker, the oil-immersed selector switch acting as bus-bar coupler; as main circuit breaker for incoming feeder to sub-station; or as main circuit breaker for a sub-station or for a consumer.

A "Type Ag" 150-A, 660-V, "gate-end" circuit breaker (fig. 77) is on view. The unit, of the totally-enclosed ironclad pattern, has been designed especially for colliery work. The major portion of the gear, including the operating mechanism, release coils and oil tank, is supported from a casting of strong cast iron. The casting is supported on a flat-iron framework, the members of which are welded and riveted, thus forming a structure of great mechanical strength. The circuit breaker, of the free-handle pattern, can be fitted with overload and low-voltage protection; the easily-renewable contacts of the breaker are of the controller pattern, and have a good wiping action.

An oil-immersed circuit breaker, rated at 600 A and 135,000 V, of the type described in our issue of April 25th (p. 678) is another exhibit. This is designed for outdoor service, and is totally-enclosed. It is made in single-pole units; any number of units may be assembled together to form a multipole breaker.

A further oil-immersed circuit breaker is the "Type Ual" (300 A, 37,000 V) (fig. 78). The breaker is designed for outdoor service, and is totally-enclosed. The circuit breaker is made in single-pole units designed for mounting on horizontal bearers. Any number of units can be assembled to form a multipole breaker. The circuit breaker mechanism is built on a cast-steel top plate of exceptional mechanical strength. A rapid speed of break is attained by means of powerful accelerating springs. Dashpots at the end of the guide rods effectively absorb the momentum of the moving portion. Three types of control are available, namely; Direct manual operation; remote mechanical operation; and remote electrical operation.

Fig. 77.—Ferguson, Pailin 150-A, 660-V "Gate-end" Circuit Breaker.

Fig. 78.—300-A, 37,000-V, Single-pole Outdoor Oil-immersed Circuit Breaker.

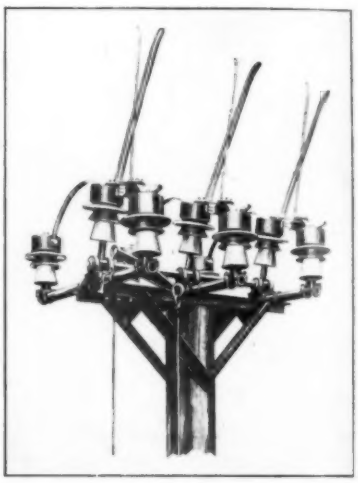

Fig. 79.—300-A, 11,000-V, Triple-pole Non-automatic Rocker Type Isolating Switch.

Fig. 80.—Ferguson, Pailin 50-A, 3,300-V, Oil-immersed Fuse for Pole Mounting.

There are also examples of air-break circuit breaker. Single, double and triple-pole patterns are available; any number of single-pole units may be combined to form a multipole breaker in which a common mechanism operates the poles simultaneously.

The "rocking" pattern isolating switches for e.h.p. service shown (fig. 79) are made in single-, double-, or triple-pole units; a common operating mechanism ensures the simultaneous operation of the poles of the multipole units. The switch (of

the outdoor pattern) is designed for disconnecting purposes, but is capable of breaking low loads or small charging currents. The movable portion of the 11,000-V single-pole switch consists of a substantial beam of malleable-iron pivoted at the centre; in the case of large sizes an operating lever of wrought-iron is provided. Guides allow movement of the rocking element in a vertical plane only, and ensure the correct alignment of the fixed and moving contacts. The moving contact, of brass, is attached securely to the top of a porcelain insulator fixed to the beam; the ample cross section and close texture of the porcelain support eliminate the danger of fracture due to bending stresses.

An oil-immersed fuse (fig. 80) which is also exhibited is suitable for either indoor or outdoor service as required. It is capable of breaking a short-circuit within a very short interval of time after the occurrence of the latter, owing to the fact that no operating mechanism, involving the inertia of heavy moving parts, is used. A safety device incorporated in the design of the unit prevents the fuse-carrier from being blown out of position when being inserted in circuit or when actually in the "on" position.

Stationary type interlocked cubicle switchgear for 11,000-V service is displayed. This gear is constructed on the "unit" principle, whereby cubicles may be installed singly, or together, to form a switchboard.

Truck-type cubicle switchgear is represented, embodying F.P. oil-immersed circuit breakers "Type P." This is designed for use in large power stations.

One of the oil-immersed circuit breakers on view is a "Type R2" breaker for 600 A at 37,000 V. The breaker is built on a substantial dome-shaped top plate, which is made of cast steel. In the higher current-carrying capacity breakers special high-resistance, non-magnetic alloy is used for the top plate to minimise heating owing to eddy currents and hysteresis. The tubular leading-in stems are bushed in bakelite insulators of the condenser pattern for the 25,000- and 37,000-V breakers. There are four breaks per pole, and a very high speed of break is obtained by an ingenious mechanism contained in the steel guide tubes, whereby the velocity of the main contact bar is superposed on to the velocity of the auxiliary-contact bar.

This brief description does not exhaust the list of Messrs. Ferguson, Pailin's exhibits; there are in all 27 examples of the firm's work, each of which is worth attention.

Radio Communication Co., Ltd.

(Stand No. 141, Avenue 15, Bays 9 and 10.)

A great amount of marine type radio equipment is to be seen on this company's stand. The largest single piece of apparatus is the 1.5-kW ship's transmitter illustrated in fig. 81. The distinctive features of the transmitter are: Automatic starting by push-button control from the operator's table; a "listening through" keying system, dispensing with a "send-receive" switch and enabling the operator to "break in" during the process of transmission, thereby greatly facilitating the rapid handling of traffic; complete control of spark frequency by means of a regulator, enabling a wide range of musical notes

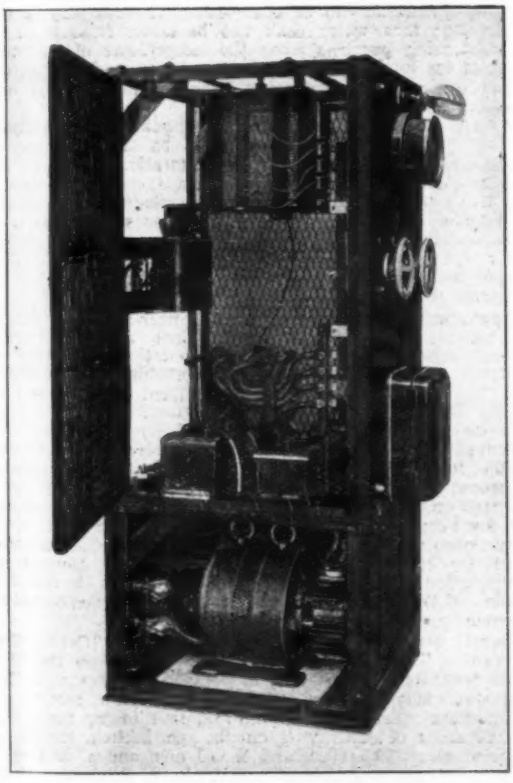

Fig. 81.—The "Polar" 1½-kW Radio Transmission.

to be obtained; and an exceptionally powerful emergency transmitter rated at .5 kW, fitted with a high-speed rotary interruptor giving a clear musical spark note of 650 frequency. The same Morse key operates both main and emergency transmitters, a change-over switch being provided. All recording instruments, wave-length, and power controls, &c., are placed on the front of the switchboard panel, whilst the various elements of the low- and high-frequency circuits (including those of the emergency gear) are arranged behind it. Below the switchboard panel there is a soundproof wooden compartment which contains the motor-alternator and the synchronous discharger. Signals radiated by both main and emergency transmitters are sharply tuned, and have high and distinctive spark frequencies which considerably facilitate reception through atmospheric or other interference. By means of a handwheel the power can be reduced to half or quarter the full value. In conjunction with this apparatus there is a triode valve receiver (fig. 82) which has great sensitiveness, and is capable of receiving either spark or continuous wave signals and telephony. The closed circuit of the receiver has an automatic wave-length indicator calibrated from 250 to 9,000 metres; this facilitates tuning. The equipment has a range of from 600 to 1,000 miles under normal conditions during daylight. A smaller set (.5 kW) is also shown. This also has a set incorporated in it for emergency operation. The range under normal conditions is between 400 and 500 miles.

A direction-finding set is shown. This consists of a receiving framework, capable of being rotated, with two windings fixed rigidly at right angles to each other. The two coils are placed in series, and the resultant signal depends on the sum or difference of the voltages induced in the coils, depending on the way in which the connections are made. The connections of one coil are arranged so that they can be reversed quickly by means of a switch. The bearing is arrived at by adjusting the orientation of the coils until signals are of equal strength in both positions of the switch.

A dial indicator is fitted to the receiving cabinet, calibrated

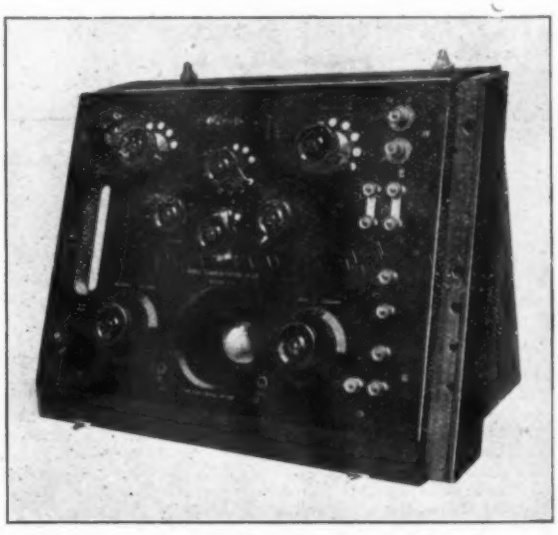

Fig. 82.—Receiver for use on Ships.

in degrees for the full circle. This gives the bearing of the distant radio station in relation to the fore and aft line of the ship. If, therefore, at the moment of determining the radio bearing a reading of the standard compass be taken, the true bearing of the ship can be easily calculated. This procedure is simplified when ships are fitted with gyro compasses if a repeater dial is installed near the direction-finder control cabinet.

Another interesting exhibit is an automatic call device which only responds to the "S.O.S." signal. A small transmitting and receiving equipment for installation in a lifeboat is also shown.

For the rest the exhibit consists of broadcasting receivers, components, and accessories.

Contracts Closed.

(*Continued from page 882.*)

Australia.—MELBOURNE.—The Postmaster-General's Department has accepted the tender of the British Insulated and Helsby Cables, Ltd., for lead-covered, paper-core telephone cable at a cost of £396,000. Sixty-five per cent. of the cable is to be manufactured in Australia.—*Reuter's Trade Service* (Melbourne).

Castlebar.—Mayo County Mental Hospital electrical scheme. Tenders totalling £3,695 have been accepted by the Committee of Management for the electric lighting of the Institution. One of the tenders accepted was for the wiring and the mains at £1,380 submitted by Mr. White, of Tullow, Co. Carlow.

Colombia.—*The Times* states that Messrs. Sir William Arrol and Co. have secured the contract for the constructional steelwork for the electrical power house to be erected by the Cartagena (Colombia) Waterworks Co.

London.—BATTERSEA.—Electricity Undertaking Committee. Accepted:—
Bailey-Jackson type strainer for the condensing water drawn from the river (£740).—Hick, Hargreaves & Co.
Portable coal conveyor (£230).—Johnson & Sons.

Normanton.—District Council. Accepted:—
Sub-station (£750).—R. Leake & Son.
Cables (£7,038).—Union Cable Co., Ltd.
Transformers (£240).—Brush Electrical Engineering Co., Ltd.
Connections to transformers (£436).—Yorkshire Electric Power Co.
L.p. switchgear (£269).—Metropolitan-Vickers Electrical Co., Ltd.

St. Helens.—Electricity Committee. Recommended:—
1,000-kW motor converter.—Bruce Peebles & Co., Ltd.
500-kVA transformers.—Metropolitan-Vickers Electrical Co., Ltd.

Stockton-on-Tees.—Corporation. Accepted:—
Two 300-kVA transformers (£716).—Ferranti, Ltd.
H.p. switchgear (£417).—Reyrolle & Co., Ltd.

Trowbridge and Melksham.—Board of Guardians. Accepted:—
Installing electric lighting at the Institution (£443).—King & Co., Bristol.

Forthcoming Events.

Empire Mining and Metallurgical Congress.—June 3rd to 6th. At the British Empire Exhibition, Wembley.

Roentgen Society.—Tuesday, June 3rd. At the Institution of Electrical Engineers. At 8.15 p.m. Annual general meeting.

Institute of Metals.—Wednesday, June 4th. At the Institution of Mechanical Engineers, Storey's Gate, S.W. At 8 p.m. Annual May lecture by Dr. F. W. Aston, F.R.S., on "Atoms and Isotopes."

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names of makers or suppliers of:—

A. N. C. accumulators.
ADIERS telephone receivers.

Notes.

The "Death Ray."—The Air Ministry on Tuesday night issued a statement regarding the negotiations which had taken place with Mr. Grindell-Matthews, explaining that in February last it had offered him an opportunity to demonstrate his apparatus to its representatives, and had renewed the offer on several occasions, without result until this week. The demonstrations proposed and carried out by the inventor consisted in lighting an "Osglim" electric lamp, and in stopping at will a small motor-cycle engine from a distance of about 15 yards. The demonstrations were carried out in the inventor's laboratory, all the apparatus being provided and arranged by him.

The departmental representatives were shown nothing which would lead them to credit the statements which had appeared in the Press as to the possibilities of the invention, and the conditions under which the demonstrations were made by Mr. Grindell-Matthews were such that it was not possible to form any definite opinion as to the value of the device.

Mr. Grindell-Matthews was accordingly offered an immediate opportunity to demonstrate the stopping, by means of his ray, of a small petrol motor to be provided by the Government. If this test proved successful he was to be paid £1,000 immediately, the only condition being that he would allow the Government fourteen days to consider the basis of further financial negotiations for the purchase or development of his invention.

Mr. Grindell-Matthews refused this offer.

Electric Tramcar-driver's Record.—The interment took place last week of Mr. Thomas Umpleby, electric car driver for Blackburn Corporation Tramways. The Tramways Committee was represented by Ald. C. Higham (chairman) and Mr. J. H. Cowell (general manager). Mr. S. Hargreaves (chief clerk), Mr. H. W. Seymour (works and permanent-way superintendent) and Mr. A. Potts (traffic superintendent) were present, along with 20 traffic employés. Mr. Umpleby went to Blackburn in 1887 in charge of the first steam car purchased by the Blackburn Tramways Co. After the electrification of the system he remained in the service of the Blackburn Corporation Tramways as an electric car driver until recently, when he was obliged to relinquish his duties on account of ill-health. During the 37 years' service with the company and Corporation Mr. Umpleby was singularly free from accidents, the total damage to vehicles for which he could be held responsible not exceedingly £5. He was highly respected by both management and staff.

Mid-Lancashire Electricity District. — THE PADIHAM GENERATING STATION.—The Electricity Commissioners have issued a statement with reference to the local inquiry held at Burnley in February last and to the applications for consent to the erection of generating stations (*a*) by the Lancashire Electric Power Co. at Padiham, and (*b*) by the Corporation of Burnley at Simonstone, in which they announce their refusal of consent in the case of the Corporation. The Lancashire Co. will therefore be allowed to establish the Padiham station subject to the following conditions: (i) An obligation will be imposed upon the Power Co. to give any necessary bulk supplies to local authorities in the district on the terms (as a maximum) adopted by both applicants at the inquiry, *i.e.*, in accordance with the scheme of bulk supply charges formulated by the Engineering Advisory Committee of the South-East Lancashire Electricity District. (ii) Provision will be made requiring the company to erect cooling towers with the first section of the station at an estimated cost of £10,000, as was proposed in connection with the application of the Corporation. (iii) With regard to the representations made on behalf of the Ribble Joint Committee and the Ribble Board of Conservators as to the effect of the discharge of condensing water upon the temperature of the River Calder, the Commissioners are satisfied that it will be necessary for precautions to be observed by the company in this connection; that water shall not be taken from the river for condensing purposes when the temperature of the river water at the intake of the generating station as a consequence of the discharge of condensing water or for other reasons exceeds 75 deg. F. will be a condition.

With regard to the evidence at the inquiry as to the transmission voltage (11,000 volts) proposed by the company, the Commissioners consider that, in the interests of the Mid-Lancashire Electricity District transmission system from East to West, a portion of the company's transmission system should be designed for working at the higher pressure of 33,000 volts. This would also be of advantage to the company from the point of view of ultimate interconnection with the rest of its system in the South-East Lancashire Electricity District *via* Rawtenstall and Ramsbottom.

Appointments Vacant.—Fourth engineer-in-charge (£345) for the Hammersmith Borough Council electricity works. Draughtsman (£277) for the Hull Corporation Electricity Department. Mains assistant for the Yorkshire Electric Power Co. Shift engineer for the Burton-on-Trent Corporation Electricity Department. Assistant electrical engineer (£357) and assistant mechanical engineer (£357) for the City of Birmingham Salvage Department. Electrical mechanician, £300+, for the Government of Uganda; Assistant switchboard attendant for the L.C.C. Tramway Department; Assistant electrical engineer, Rs.700 per mensem, for the Commissioners for the Port of Calcutta. Assistant masters for H.M. Dockyard Schools at Devonport and Rosyth. Switchboard attendant for the Derby Corporation Electricity Department. Engineering assistant in the mains department for the Newcastle and District Electric Lighting Co., Ltd. (See our advertisement pages to-day.)

Local Societies.—CABLE COMMUNICATION.—"Cable Communication" was the subject of an address before the Chartered Institute of Secretaries, meeting in conference at Manchester on May 22nd, by Mr. Edward Wilshaw, secretary of the Eastern Telegraph Co., who said that to-day there were 325,000 miles of cable lying on the sea bottom, the capital invested was £60,000,000, and 28,000 men and a fleet of 50 ships were employed in the service. Large extensions of the cables had recently been made, and the Eastern Co. alone had sunk a further £3,000,000 in new cables.

WORKS VISIT.—Last week a party of about 60 members of the Birmingham and District Electric Club visited the works of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park. They arrived by special tramcar from London Road Station, which the company provided, at 11 o'clock, and were entertained to luncheon, leaving again by special tramcar at 4.45 p.m. During their visit a tour of inspection was made round the main shops, including the wireless and meter departments and the foundry, a considerable portion of the time being spent in the research laboratories, including the extra high-pressure laboratory with its 20,000-, 100,000-, and 500,000-volt transformers. The blinds in this laboratory have push-button control for raising or lowering and an exhibition of 100,000 V applied to a glass disk in the darkened room was much appreciated.

Institution Notes.

Institution of Electrical Engineers.—DELEGATES FROM KINDRED INSTITUTIONS OVERSEAS.—The Council has invited delegates from the following kindred institutions abroad to visit this country as the guests of the Institution from July 10th to 15th next:—

American Institute of Electrical Engineers.
Associacion de Ingenieros de Caminos, Canales y Puertos, Madrid.
Associacion de Ingenieros Industriales, Madrid.
Associazione Elettrotechnica Italiana.
Dansk Ingenirforening, Denmark.
Den Norske Ingenirforening, Norway.
Engineering Institute of Canada.
Institute of Engineers (India).
Institution of Engineers, Australia.
Koninklijk Instituut van Ingenieurs, Holland.
Schweizerischer Elektrotechnischer Verein.
Société Belge des Electriciens.
Société Francaise des Electriciens.
South African Institute of Electrical Engineers.
Svenska Teknologforeningen, Sweden.
Vereeniging van Directeuren van Electricitatsbedrijven in Nederland.

On account of the large number of delegates, it will not be possible for the general body of members of the Institution to take part to any great extent in the functions arranged for the entertainment of the visitors, but members, associate members, and associates will be given the opportunity of attending (*a*) the luncheon at the Hotel Cecil on Thursday, July 10th (the presence of ladies at this function will be welcome). The charge for luncheon tickets, inclusive of wines, will be 15s. per person; (*b*) the Kelvin Centenary Banquet at the Connaught Rooms on Friday, July 11th (men only), Lord Balfour, O.M., in the chair. The price of tickets for this function will be £2 2s. each, wines included. Full particulars will be circulated in due course.

The programme, which has already been outlined in our pages in connection with the World Power Congress, includes a reception on Thursday, July 10th, when Dr. Alex. Russell, president, will deliver an address of welcome, followed by luncheon at the Hotel Cecil, and the Kelvin Centenary Oration by Sir J. J. Thomson, O.M., F.R.S., and the presentation of the Kelvin Medal to Prof. Elihu Thomson.

On the following day there will be a visit to the British Empire Exhibition, and in the evening the Kelvin Centenary Banquet.

On Saturday, July 12th, a visit will be paid to Cambridge, by special train. On Sunday seats will be reserved at Westminster Abbey and St. Paul's Cathedral for the morning services, and the Zoological Gardens will be open to the visitors. On Monday there will be a visit to Birmingham and Stratford-on-Avon, and on Tuesday a visit to the London Underground Railway repair shops, and to Windsor, with a conversazione in the evening.

The annual conversazione of the Institution will be held at the Natural History Museum on Thursday, June 26th, the centenary of the birth of Lord Kelvin. Delegates who are in London on that date will receive invitations from the secretary of the Institution, if they send him their names and addresses.

NOMINATIONS FOR COUNCIL.—The following gentlemen have been nominated by the Council to fill the vacancies that will occur on September 30th, 1924:—*President*: W. B. Woodhouse (engineer and manager, Yorkshire Electric Power Co.); *Vice-Presidents*: S. Evershed (chairman, Messrs. Evershed and Vignoles, Ltd.), and A. Page (Electricity Commissioner); *Hon. Treasurer*: P. D. Tuckett (chairman, Edmundson's Electricity Corporation, Ltd.); *Members of Council*: W. E. Highfield (partner, Messrs. J. S. and W. E. Highfield); H. W. Jones (electrical engineer, Southern Railway Co.); B. Longbottom (managing director, Electromotors, Ltd.); E. H. Shaughnessy, O.B.E. (Wireless Section, G.P.O.); and the Viscount Falmouth (director, Messrs. C. A. Parsons & Co., Ltd.).

WESTERN CENTRE.—Some 65 members attended the Western Centre summer meeting held at Torquay from May 23rd to 26th. Leaving Bristol in motor charabancs on the Friday morning, halts were called at Wells for the purpose of viewing the cathedral and at Glastonbury for luncheon, which was taken at the Old Pilgrim Inn. A stop was made at Honiton for tea at the Dolphin Hotel and after arriving at Torquay in the evening a brief meeting was held at the Victoria and Albert Hotel, which was made the headquarters, for the formal business of the annual general meeting and declaration of the result of the ballot to fill vacancies on the committee. On the Saturday morning, the members, most of whom were accompanied by their wives, visited the Corporation's new sub-station, over which they were conducted by Alderman J. Taylor, chairman of the Electricity Committee, and Mr. H. F. G. Woods, borough electrical engineer. Mr. J. W. Leach, London manager of the British Thomson-Houston Co., Ltd., which supplied most of the plant at the new station, described it to the visitors. The station, which is not yet in operation, is designed to supply only the town of Torquay and will be fed from the new generating station at Newton Abbot, the change over being expected to be made in about three weeks or a month's time. The plant consists of three rotary converters, compound-filled high-pressure switchgear for the general supply of the town, and a set of transformers and low-pressure switchgear to supply power for the tramway system. The sub-station will be connected with the Newton Abbot power station by 10,000-volt three-phase mains. A feature of the installation is a cellular switchboard, the first that the British Thomson-Houston Co. has put in anywhere, which is claimed to be simple and cheap. Leaving the sub-station at Torquay the visitors proceeded to Newton Abbot by charabanc, where an interesting hour was spent at the power station. Then they went for a trip over Dartmoor to Widecombe, where they were the guests of the Torquay Corporation Electricity Committee at luncheon at the Old Inn. Upon returning to Torquay they were the guests of the Mayor (Councillor G. H. Iredale) at a reception at the Town Hall, and in the evening were entertained to dinner at the Pavilion by the Torquay Tramways Co., Ltd. On the Sunday a trip up the River Dart had been arranged, the return to Bristol being made by charabanc on the Monday.

IRISH CENTRE.—At a meeting in Dublin of the Institution of Electrical Engineers (Irish Centre), Mr. R. N. Tweedy in the chair, a paper dealing with electrical equipment for printing presses was read by Mr. A. G. Bruty, M.I.E.E. The lecture, which was illustrated with lantern slides, dealt with the application of electricity in the driving of all types of machines used in printing works. The most modern arrangements for driving linotypes, monotypes, and other small machines, up to the large newspaper and magazine rotary presses, requiring 100 h.p. and more, were described. The lecturer pointed out that the main improvements in the last 15 or 20 years in the electrical driving of printing machines had taken place in the methods employed for controlling, starting, and stopping, and obtaining the wide speed variations called for by modern requirements. He described a number of electrical installations, all of which have been installed in Dublin within the last two or three years. Curves prepared by the lecturer were also shown giving details of the power taken by the various types of printing machines at different printing speeds.

Institute of Metals.—MAY LECTURE.—The annual May lecture will be delivered by Dr. F. W. Aston, F.R.S., at the Institution of Mechanical Engineers, Westminster, on June 4th, the subject being "Atoms and Isotopes." Invitations to the lecture can be obtained from Mr. G. Shaw Scott, M.Sc., secretary, Institute of Metals, 36, Victoria Street, S.W.1, by sending a stamped addressed envelope.

Institution of Civil Engineers.—At the annual general meeting, held on May 13th, the result of the ballot for the election of officers was declared. The president is Mr. Basil Mott, C.B.; vice-presidents, Sir W. H. Ellis, G.B.E., D.Eng., Mr. F. Palmer, C.I.E., Sir Archibald Denny, Bart., and Mr. E. F. C. Trench, C.B.E., M.A., B.A.I. Amongst the other Members of the Council are Sir Dugald Clerk, K.B.E., D.Sc., F.R.S., Col. R. E. B. Crompton, C.B., R.E. (T.), Sir R. A. Hadfield, Bart., D.Sc., D.Met., F.R.S., Sir R. A. S. Redmayne, K.C.B., M.Sc., Capt. M. H. P. Riall Sankey, C.B., C.B.E., R.E. (ret.), and Sir J. F. C. Snell. The new Council will take office on the first Tuesday in November.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Mr. E. J. BLACK, Luckington, Dalkey, has been elected resident engineer and manager by the Kingstown Urban Council for its new electrical undertaking. There were six other candidates.

Mr. F. W. ENDEAN, manager of the Middleton Electric Traction Co. since 1905, has been appointed manager of the Gateshead and District Tramway Co.'s undertaking.

Bedford Town Council has appointed Mr. J. R. BLAIKIE as construction engineer in connection with the extensions to the electricity works.

Mr. P. R. BLAKE, A.M.I.E.E., general manager of the Gravesend and Northfleet Electric Tramways, Ltd., has been appointed general manager of the Scottish General Transport Co., Ltd., Kilmarnock. He is succeeded by Mr. C. D. STANLEY, A.M.I.E.E., who for ten years held the position of engineer and manager to the St. Helens tramways, and subsequently for 3½ years was a technical officer at the Ministry of Transport.

Mr. WILFRED M. PUDGE, who has been with Messrs. George Kent, Ltd., Luton, as works engineer for the past eleven years, has joined Messrs. Dowding & Dickinson, machine tool merchants, of Victoria Street, London, S.W.

The *Industrial Australian and Mining Standard* states that Mr. A. A. WATKINS, M.I.E.E., chief assistant engineer of the Municipal Tramways Trust, Adelaide, has been appointed acting chief engineer during the absence abroad of Mr.

W. G. T. Goodman, M.Inst.C.E., M.I.E.E., chief engineer and general manager of the Trust. Mr. C. R. Moyes, secretary and assistant manager, has been appointed secretary and acting general manager. Mr. W. G. T. Goodman is visiting England and America on important Trust business.

A *Reuter* dispatch from Philadelphia states that the Franklin Institute, through Mr. H. G. Chilton, Counsellor of the British Embassy in Washington, has presented to Sir Ernest Rutherford the Franklin Medal and Certificate in recognition of his discovery of the principle of radio-activity.

Mr. Arthur Walkington, of the Electrical Equipment and Carbon Co., Ltd., London, has taken up an appointment with T. Beadle & Co., Ltd., wholesale factors and importers, of Hull, and will represent them in the Midlands, South Yorks., and the North.

A *Reuter* dispatch states that Prof. J. C. McLennan, F.R.S., of Toronto University, has been elected president of the Royal Society of Canada.

Mr. Guy Allbut, electrical engineer for the City of Newcastle, New South Wales, is in this country until the end of July. Those who wish to confer with him respecting manufacturing facilities in Australia should communicate with him care of Mr. J. Davis, 115, Victoria Street, London, S.W.1.

Obituary.—Mr. A. D. Bromley.—We regret to record the death of Mr. A. D. Bromley, of the lamp and wiring supplies staff of the British Thomson-Houston Co.'s Birmingham office. Mr. Bromley, who was well-known in the Birmingham and Leicester districts, passed away on May 15th after an operation.

Mr. W. A. Crawshaw.—The funeral took place, last week, of Mr. Wm. A. Crawshaw, of Clayton-le-Moors, who was employed at Accrington Corporation electricity works. The staff and employés of the works sent floral tributes and were represented at the funeral.

Wills.—The late Dr. W. H. Maw left £149,880 gross and £141,058 net personalty.

Mr. P. J. Marshall, a director of Marshall, Sons & Co., Ltd., of Gainsborough, left £44,413 gross and £38,685 net personalty.

Sir A. J. Leppoc-Cappel left £58,083 gross and £57,856 net personalty.

New Companies Registered.

Filograph (Parent) Co., Ltd. (197,971).—Registered May 15th. Capital, £30,000 in £1 shares. To acquire and turn to account an invention relating to improvements in sound recorders and reproducers and to adopt an agreement with W. F. Croll. The first directors are:—C. P. Adcock, Chateau de la Pièce d'eau Chatou (S. et O.), France, chairman; W. E. E. Adolph, 5, Brickhill Lane, E.C., wine shipper; E. Bodle, 288, Regent Street, W.1; W. F. Croll, 1, Museum Street, W.C.1 (director, Automotive Innovations Syndicate, Ltd.). Minimum cash subscription, 7 shares. Qualification, 250 shares. Remuneration, £100 each per annum. Secretary: J. B. Wandless. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, W.C. Registered office: 1, Museum Street, W.C.

Waterhouses (Electricians), Ltd. (197,960).—Private company. Registered May 15th. Capital, £500 in £1 shares. To carry on the business of manufacturers of, and dealers in instruments, apparatus, accessories, and all materials used in connection with radio and wireless telegraphy and telephony, electricians, &c. The subscribers (each with one share) are:—W. E. Moorhouse, 127, Carlton Street, Castleford, optician; C. T. Waterhouse, "Woodleigh," Smawthornes Lane, Castleford, electrical engineer. The subscribers are to appoint the first directors. Qualification, 30 shares. Secretary: J. W. E. Moorhouse. Solicitor: H. C. Bowling, 24a, Bond Street, Leeds. Registered office: Stephen's Buildings, Bank Street, Castleford, Yorks.

John Adams, Ltd. (197,965).—Private company. Registered May 15th. Capital, £7,000 in £1 shares (6,000 6 per cent. cumulative preference and 1,000 ordinary). To carry on the business of electrical, mechanical, and consulting engineers, electric light and power installers, manufacturers of, and dealers in wireless installations, &c. The first directors are:—A. N. Barlow, "Stathern," Westhouse Road, Birkdale, Lancs., company director; F. Ashworth, "The View," Haslingden, Lancs., cotton manufacturer; J. Adams, address not stated. The two first-named are permanent. Qualification, £100. Secretary: A. N. Barlow. Solicitors: Denham and Jackson, 78, King Street, Manchester. Registered office: 15, Tariff Street, Dale Street, Manchester.

Princess Electrical Co., Ltd. (198,035).—Private company. Registered May 19th. Capital, £1,000 in £1 shares. To acquire the business now carried on at 169, Princess Street, Manchester, by Russell V. Wright as "The Princess Electrical Co.," and to carry on the business of electrical engineers and contractors, telephonic and wireless telegraphy engineers and fitters, &c. The subscribers (each with five shares) are:—G. O. Lewtas, Park Lodge, Park Road, Timperley, Ches., lamp manufacturer; J. Lewtas, Vernon Bank, Doveston Road, Ashton-on-Mersey, lamp manufacturer; R. V. Wright, 161, Marsland Road, Sale, Ches., electrical engineer; T. W. Knox, 11, Manor Road, Sale, Ches., salesman; G. S. Lewtas, Park Lodge, Park Road, Timperley, Ches., lamp manufacturer; A. F. Rowntree, 18, Clegg Street, Oldham, chartered accountant. G. O. Lewtas signs documents as a director. Qualification, £5. Solicitor: E. G. Claydon, Prudential Buildings, Union Street, Oldham. Registered office: 169, Princess Street, Manchester.

"Walco" Electrical Co., Ltd. (198,001).—Private company. Registered May 16th. Capital, £1,000 in £1 shares. To acquire the business of electrical installation contractors and radio instrument manufacturers, &c., carried on at 30a, Highgate Road, Kentish Town, as "The Walters Electrical Co." The first directors are:—I. Shapin (permanent managing director), 22, Glenloch Road, Hampstead, N.W.3; F. Walters, 102, Alexandra Park Road, Muswell Hill, N.10. Qualification, £5. Secretary: E. V. Kayley. Registered office: 15, Cromer Street, Gray's Inn Road, W.C.1.

B. H. M., Ltd. (198,024).—Private company. Registered May 19th. Capital, £5,250 in 5,000 7 per cent. cumulative preference shares of £1 and 5,000 ordinary shares of 1s. To adopt an agreement with T. H. Bailey and W. Evans and to develop and turn to account the invention for improvements in portable electric safety lamps referred to therein. The first directors are:—T. H. Bailey, "Wyldecroft," Wokingham, mining and civil engineer; G. C. H. Hamilton, Basildon House, 7, Moorgate, E.C.2; G. E. M. Mundy, "Red Rice," Andover, Hants. Qualification, £5. Solicitors: Kirby, Millett & Ayscough, 2 and 3, The Sanctuary, Westminster. Registered office: 2 and 3, The Sanctuary, Westminster.

Leeds Radio Services, Ltd. (198,067).—Private company. Registered May 20th. Capital, £2,500 in £1 shares. To carry on the business of dealers in, and contractors for the supply of instruments, appliances, apparatus, and accessories for use in connection with radio or wireless telegraphy and telephony, &c. The provisional directors are:—J. Carr, "Dyneley House," Skipton, wireless engineer; H. Turtle, "Brentwood," Horsforth, near Leeds, solicitor's clerk. Qualification, £100. Remuneration as fixed by the company. Solicitor: A. E. Masser, 7, Park Square, Leeds. Registered office: 50, Albion Street, Leeds.

Liver Radio Manufacturing Co. (2,328 F).—Particulars were filed on May 20th, pursuant to Section 274 of the Companies (Consolidation) Act. The capital is £2,000 in £1 shares. The company was incorporated in the Isle of Man on March 31st, 1924, to carry on in the Isle of Man, the United Kingdom, and elsewhere the business of manufacturers, importers and exporters of wireless apparatus, dealers in wireless sets, valves, headphones, accumulators, electric lamps, &c. The British address is 30, Islington, Liverpool. F. H. Henri, of 2, Bixteth Street, Liverpool, is authorised to accept service of process and notices on behalf of the company. The directors are:—W. H. Rowlands, 6, Tramway Road, Aigburth, Liverpool; A. Panagaris, 60, Deane Road, Fairfield, Liverpool, produce merchant; and T. Pritchard, 18, Gresford Avenue, Liverpool, traveller.

C. B. King (Magnetos), Ltd. (198,054).—Private company. Registered May 20th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers and vendors of, and agents for, and dealers in magnetos and magneto parts, automobiles, aeroplanes, airships, &c. The first directors are:—C. B. King, 4, Pandora Road, West Hampstead, N.W.6, engineer; P. Harman, "Nether House," Green Lane, Northwood. Solicitor: H. B. Judge, 317, High Holborn, W.C. Registered office: 88, Great Portland Street, W.1.

Official Returns of Electrical Companies.

A. Smethurst & Sons, Ltd.—Debenture dated May 8th, 1924, to secure £2,100 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. A. Smethurst, "Milton Lodge," Milton Road, Woolston, Southampton.

North Wales Power Co., Ltd.—Particulars filed of £1,700,000 guaranteed debenture stock authorised by resolutions of January 17th and May 12th, and covered by trust deed dated May 12th, 1924, charged on certain rights, sums to become payable, lands and buildings, and the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,500,000. Trustees: Whitehall Trust, Ltd.

Cooke & Whitfield Wireless, Ltd.—Debenture dated May 9th, 1924, to secure all moneys due and to become due charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Western Electric Co., Ltd., Connaught House, Aldwych, W.C.

Wireless Equipment, Ltd.—Particulars filed of £1,600 debentures authorised April 16th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Simmonds & Stokes, Ltd.—Issue on May 13th, 1924, of £100 second debentures, part of a series already registered.

Ubique Welding Co., Ltd.—Mortgage on land in Galgate Street, Old Trafford, Manchester, dated April 11th, 1924, to secure all moneys due or to become due from the company to the Union Bank of Manchester, Ltd.

Satisfaction in full on March 14th, 1924, of mortgage dated May 26th, 1921, securing all moneys due or to become due.

Dubilier Condenser Co. (1921), Ltd.—Satisfaction in full on November 30th, 1923, of debenture dated February 13th, 1922, securing £7,000. (Notice filed May 14th, 1924.)

Porter, Turk & Son, Ltd.—Satisfaction in full on May 3rd, 1924, of debenture dated July 28th, 1919, securing £2,700.

Strode & Co., Ltd.—W. G. Jeffreys, of 66, Coleman Street, E.C., was appointed receiver on May 5th, 1924, under powers contained in debenture dated January 31st, 1913.

J. W. B. Accumulators, Ltd.—F. H. Conning, of 4, Great Winchester Street, E.C., was appointed receiver on May 7th, 1924, under powers contained in debenture dated September 12th, 1923.

W. T. Rawcliffe, Ltd.—F. M. Gilliat, of 36, Spring Gardens, Manchester, was appointed receiver on May 9th, 1924, under powers contained in debenture dated June 6th, 1923.

Morley Electrical Engineering Co., Ltd. (52,358).—Return dated February 25th, 1924. Capital, £5,000 in £1 shares. All shares taken up. £3,980 paid. £1,020 considered as paid. Mortgages and charges, £3,000.

Thos. W. Ward, Ltd. (81,020).—Return dated November 2nd, 1923. Capital at date of return, £1,100,000 in 150,000 first preference, 250,000 second preference, 600,000 ordinary, and 100,000 employés' shares of £1 each (increased in November, 1923, to £1,350,000 in 150,000 first preference, 375,000 second preference, 725,000 ordinary, and 100,000 employés' shares of £1 each). 150,000 first preference, 250,000 second preference, 600,000 ordinary, and 32,485 employés' shares taken up. £628,522 paid. £483,963 considered as paid. Mortgages and charges, nil.

Return of allotments, made up to February 15th, 1924, shows a further 99,408 second preference and 86,468 ordinary shares allotted, all payable in cash.

City Notes.

Callender's Cable and Construction Co., Ltd.

Sir J. Fortescue Flannery, Bart., presided at the annual meeting held on May 22nd. In proposing the adoption of the report, published in our last issue, the chairman said that a year ago he ventured to express his confident hope in the future of the electrical cable trade. To-day he addressed them with even greater confidence because, although the expected revival of trade throughout the world had been much slower than had been forecast by nearly every business man, the volume of their trade had been very satisfactory. They had done more business over an increasingly wide area than they had ever done before, but the profits in proportion to the volume

of business done had been less than what they had been accustomed to. They had done more work, with the result that they had earned a larger profit than ever before. That profit had been earned in the face of world competition. Their operations, whilst they had been satisfactory at home, had ranged literally from China to Peru with regard to their foreign business. They had been successful in meeting competition because their expenses had been reduced, not by stinting those who worked for them, but because they had larger factories and more plant, which had been continually improved and modernised. Then, again, the larger the turnover the easier was the burden of the inevitable establishment charges. Last year he spoke of the great improvements that they had made by their manufacture of e.h.p. cable up to 55,000 volts—a pressure that a few years ago would have been regarded as quite impossible, but which they dealt with to-day as a matter of ordinary manufacture. They were prepared to undertake contracts for that high voltage with the same confidence and certainty of success as they could in the old days when the voltage was a mere fraction of that figure. Already they had made and sold very large quantities of that high-pressure cable, and they looked forward to its being recognised as a great economiser for power stations, with the result that it would be more largely used in the future. It would tend to cheapen the applied services of electricity, and therefore be a benefit to the community at large. Before the war the company had a fine Continental business, which the war destroyed. Since peace they had tried very hard to revive that trade, but they had not in any degree succeeded, owing to lack of confidence and the continual variation in the rates of exchange. Later on those difficulties must disappear, and they might rely upon it that when they did the management would not be behindhand in endeavouring to successfully revive their Continental connections. The fact that the Continental trade had not been favourable to them had had a great compensating advantage, because it had caused the management to turn their eyes more to our Dominions and to India, and the immense natural reserves of water power from the mountains, which could only successfully be harnessed to industrial use by electrical cables, had given them a very large and a very useful amount of occupation. The home demand had been very satisfactory, indeed, that was very largely the basis of their prosperity, but it was the intention of the board to develop the trade in the Dominions and in India to the fullest possible extent, both for their business interests and also because they would thereby be doing substantial service towards the great cause of Imperial unity throughout the Empire. The shareholders would be glad to have the assurance that the plant and buildings had been kept in first-class condition out of revenue, and their properties, both at home and abroad, were never in a better condition than they were at the present time. Proceeding to refer to the balance sheet, the chairman said he would like to emphasise the fact that although their goodwill was of great value and their patents were constantly increasing, they were not put down in the balance sheet as of any value at all. They had added to their machinery and plant £33,895, although they had subsequently depreciated it by the sum of £30,000. Stocks of raw materials and manufactured goods were shown at £274,143, or about £60,000 more than a year ago. On the other hand, the expenditure on uncompleted contracts was this year only £110,000, as compared with £291,000. That simply meant that the number of contracts in course of completion at the date of the balance sheet was somewhat lower. Sundry debtors were £869,000, as against £512,000, an increase of £357,000, which was some indication of the development which had taken place in the business during the year. The cash in hand and at the bank was larger by £40,000 than it was a year ago, whilst bills receivable were lower by £30,000. It was a healthy feature that they had plenty of liquid resources. On the debit side, trade creditors, £592,000, compared with £456,000, the difference being attributable to the increased trade. Turning to the profit and loss account, the general expenses showed a reduction of about £10,000. Repairs and maintenance had increased by £4,000. The depreciation provided was on the same lines as in previous years, and as a final result they had a profit for the year of £264,000. After making provision for payment of interest on the debenture stock and dividends on the preference shares, there was a balance of £164,000, to which they added the balance brought forward from 1922 of £226,000, making a total of £390,000. Bearing in mind the future requirements of the business, the board thought that the proper course to pursue was to make the same distribution as last year on the ordinary shares—3s. per share, or 15 per cent., less income tax. The payment of that dividend might arouse criticism in some quarters, but he would point out that since the commencement of the company it had been a thrifty and prudently-managed undertaking, and the policy of retaining a large proportion of the profits and employing them in the business had been consistently pursued year after year. The result was that the profits now earned were not earned simply on the capital which had been invested, but also upon those reserves, and on that basis it would be found that the dividend was not 15 per cent., but somewhere nearer to the modest figure of 7 per cent. upon the capital invested in the company. As to the future, so far as the present year was concerned the influx of orders had been satisfactory up to date, and it looked as though the results of the current year would not be inferior to those of the past 12 months.

Sir T. O. Callender, J.P., the managing director, in seconding the motion, after paying a tribute to the excellence of the staff and the workpeople, said that the business in which the company was engaged was changing and developing very rapidly. They were pioneers of the industry, and had to cut their own road to success, and in many cases it was a thorny path. Of course, they made mistakes at times, and they had to put them right, but they were working towards the greatest possible success, and they hoped that what they had done already would be surpassed at no distant date, and would be an addition to the cheap distribution of electricity throughout the country. The company's football team had carried off the trophy this year of the London Football Association of Business Houses. Sir Tom said that one of the most interesting areas in which the company was carrying on work abroad was in Australia. They had been there for a good many years, and during the last 12 months they had been successful in obtaining most important orders from the municipalities of Sydney and Brisbane, and from Auckland and Wellington in New Zealand; the Government of the Commonwealth, in spite of the efforts it was employing to make its own cables, had given them a fairly reasonable share of the telephone business there. India had always been one of their strongholds. They had very large connections in that country, not only in Bombay, which was their standby, but in Calcutta, Hyderabad, and other cities they were doing a large amount of work. At Hong Kong in China, where they had recently established their own office, they had secured a very large order for the city of Hankow, and they had secured other orders. South America had also been very good to them. They had done very well in Chile and at Montevideo. At the Cape they were also busy, and they had had quite a large lot of orders from the West Coast of Africa—in fact at whatever part of the world they looked they would find the company active. The outlook was reasonably satisfactory, and he had every reason to believe that, whatever might be the fate of other industries in engineering, the cable-making industry would be able to show a good result for 1924, and he was sure that Callender's would not be one of the companies to disappoint its shareholders. The report was unanimously adopted.

Vickers, Ltd.

In their report for 1923 the directors state that the slight improvement in the trade outlook mentioned last year was not maintained. Foreign business, moreover, was extremely difficult to obtain owing to the continued depreciation in exchanges and the general political situation abroad. Competition, therefore, remained exceedingly keen and prices very low, as in all branches makers were prepared to take orders to keep their works going at prices including no profit, and sometimes only part charges. These conditions affected all sections of the company's business. The company's works were, fortunately, free from labour troubles, except at Barrow-in-Furness, where the very serious dispute with the Boilermakers' Society, lasting between seven and eight months, created serious disorganisation in the shipyard, with the inevitable effect of disorganising other departments. The outlook is at present rather better for the company than at any time during the last few years. A considerable reduction may, however, be expected in the company's output of motor-car steel owing to the abolition of the McKenna duties. The directors had hoped that by now trade conditions would have so far settled down as to allow of a review of the company's assets and a definite allocation from the company's very ample reserves against items that might appear doubtful in the light of post-war experience. Conditions, however, are still so far from normal that it is not possible to do this with regard to land, buildings, plant, &c., the reserve against which remains at £3,200,000, but the directors have decided to write off altogether in a few cases, and in others make specific reserves against certain investments in subsidiary and connected companies, chiefly in respect of works taken over during the war period, against doubtful debts owing to the company, and against possible liabilities and unsettled claims. Time may show that a substantial proportion of these reserves may not be required. The directors do not recommend the payment of a dividend on the ordinary shares for 1923.

Anglo-Argentine Tramways Co., Ltd.

The report for 1923, which is to be submitted at the annual meeting on June 3rd, states that the gross receipts amounted to £4,484,782, and working expenses to £3,493,572, leaving a balance of £991,210. After deducting interest, sinking fund, and other charges, and adding interest on investments, &c., £12,829 brought forward, and £20,000 from contingencies reserve, there remains to be dealt with a balance of £372,638. Dividends are to be paid on the first (5½ per cent.) and second (6 per cent.) preference shares, and a sum of £13,638 is to be carried forward. Although the number of passengers carried rose from 469,512,046 to 518,533,178, the receipts fell by 0.9 per cent. The working expenses represented 71.56 per cent. of the receipts as compared with 71.39 per cent. in 1922. The renewals expenditure during the year was £109,100, while the allocation to renewals reserve charged against revenue was £150,000. The arbitrary reduction in fares from 12 to 10

cents (while leaving the company with onerous obligations which the higher fare was intended to mitigate) has continued in operation since April, 1923, with the result that the earnings were insufficient to permit of the payment of the full second preference dividend, and £20,000 has had to be transferred from the contingency fund for this purpose. The holders of the ordinary shares are deprived of a dividend for the tenth consecutive year. The treatment to which the company has been subjected handicaps it severely in its endeavours to improve the conditions of employment, and extend services which have been of great benefit to the public of Buenos Aires. Although the company's scheme for the alleviation of traffic congestion in the city, by the construction of a second subway or underground tramway, has been approved by a committee of experts appointed by the Municipal Council no decision has yet been arrived at. The delay involves the company in serious monetary loss, and is detrimental to the community, and it is hoped that a solution fair to the company and the city will soon be reached.

Siemens Bros. and Co., Ltd.

The report of the directors for the year ended December 31st, 1923, to which we alluded briefly last week, says that the company's output for the year shows a considerable increase over that for 1922, but the shops were still not working to full capacity for the greater part of the year, and only in the later months was the revival in trade fully felt. This revival did not extend to the company's foreign business, in which orders had still been difficult to obtain and the prices had remained poor. The general improvement was reflected in the profit for the year, which, however, was not altogether satisfactory owing to the factory not being normally occupied for the whole year and to the meagreness of foreign business. Happily efforts to secure orders were rewarded in the autumn, when the improvement in business became more pronounced, permitting a much increased rate of production, enabling the directors to clear off the arrears of dividend due on the 10 per cent. cumulative preference shares, and providing a more substantial balance of orders in hand for carrying forward to 1924. The additions to the lead cable shops had been justified by the orders in hand and by the demand in view for lead-covered electrical cables. A new type of lead-covered paper-insulated submarine telephone cable was being manufactured in these shops for the British Post Office, for laying between England and Holland, which was the first cable of its type made in this country. Since the sale of the dynamo works to the English Electric Co., Ltd., the business of the subsidiary company, Siemens Brothers Dynamo Works, Ltd. (now known as the Caxton Electric Developments, Ltd.), had been extended in other directions in the exploitation of business for the development of electrical inventions and enterprises. The whole of the capital of the Caxton Electric Developments, Ltd., continued to be held by this company. The articles of association of the Caxton Co. had been brought up to date, and the shareholders of this company were to be asked at the general meeting on Wednesday last to sanction the payment by the Caxton Co. of the remuneration of the directors of that company all of whom at the present time are directors of the Siemens company. "Negotiations are in progress with the Inland Revenue authorities for the adjustment of the company's outstanding liability to excess profits duty for 1918, 1919, 1920. Preliminary computations of the liability had been received from the authorities, and the whole matter seemed to be approaching finality when the authorities notified their intention to revise the settlement made with them to December 31st, 1917. To this the company does not agree, and the matter is now in the hands of the company's legal advisers."

The profit for the year per profit and loss account was £162,229. From this are deducted: Interest on and redemption of 4½ per cent. debenture stock, £67,439; income tax liability for 1923, £24,338; dividend on £300,000 10 per cent. cumulative preference shares for 18 months to December 31st, 1923, £45,000; leaving the balance of profit for the year at £25,452, plus £127,310 brought forward from 1922, making a total balance of £152,762, which it is proposed to carry forward on account of the unsettled liability for excess profits duty. The results of the trading for the current year up to date are satisfactory, and, "if continued, as seems probable, the directors will be in a position to declare an interim dividend on the ordinary shares for the current half-year."

Calcutta Electric Supply Corporation, Ltd.

Lord Meston (chairman) presided at the annual meeting on May 19th, and in presenting the report and accounts (which were reviewed in our last issue, p. 852), said the company's capital position was practically unchanged. The addition of £300,000 to the liabilities merely represented the completion of the £500,000 loan, which was raised in 1922, guaranteed by the Treasury. There was a corresponding increase in the company's assets, which were still further supplemented by additional generating plant and distribution mains after the close of the year. Although there had been an increase in the gross profit, the net profits available for distribution were not higher. This was due to the growth in the capital charges, and the necessity for increased provision for depreciation. The company had been hard pressed in its endeavours to keep pace with the demand for energy. Plant ordered and promised years ago continued to be held up by manufacturing difficulties, and although 1,640 new connections were made during 1923, there was still a waiting list of nearly 2,000 at the end of the year. The position was rendered more difficult by troubles which arose in connection with the two 30,000-V main cables to the southern part of Calcutta. Steps were being taken to provide an alternative or supplementary means of supply for this area. The extensions at Cossipore were nearing completion, and the new plant would be on load shortly. With regard to the current year, the chairman said that the price of coal in Calcutta had commenced to fall; the sales for the first quarter of the year showed a marked improvement; exchange seemed to be tending to come to rest near the old parity level of 16d. to the rupee; and the political sky was clearer than at any time since 1919.

Shanghai Electric Construction Co., Ltd.

The report for 1923, which was presented at Wednesday's meeting of the company, records an operating profit of £101,771, as compared with £96,998 in 1922; this is the highest yet attained. The total profit was £107,433, and to this was added £17,030 brought forward, making £124,463. Provision for corporation profits tax required £4,000; £15,000 is transferred to the renewals reserve; £1,069 is contributed to the staff provident fund; and two interim dividends of 6 per cent. absorbed £48,000. It was proposed to pay a further dividend of 8 per cent. (making 20 per cent. for the year), and to carry forward a balance of £24,393. The loss by depreciation of subsidiary coinage in 1923 was £168,450—more than 42 per cent. on the share capital. To counteract this a new scale of fares was instituted in January last, and since that time traffic receipts and profits have shown a marked improvement. Owing to unexpected delays, the signing of the concession agreement with the Municipal Council for the extension of the company's railless system did not take place until the 17th inst. The new concession provides for the opening of 15 miles of new traffic routes within a period of three years, and it will be necessary to provide a large number of additional railless cars, with shed accommodation, and general equipment. It is proposed to offer to shareholders, rateably with their holdings, 100,000 shares of £1 each at a price to be determined. The reorganisation of the Singapore Electric Tramways, Ltd., has been fully sanctioned, and is proceeding. A new Traction Ordinance is being arranged, and when this has been passed, a new company will be formed under the title, "The Singapore Electric Traction Co., Ltd." An issue of £250,000 of debenture stock, unconditionally guaranteed by the Shanghai Co., will be made for the purpose of converting the system to railless traction and the re-equipment of the undertaking as a whole. The undertaking will be managed by the Shanghai Co. in consideration of a half share of the net profits. The existing undertaking is at present being carried on at a profit by the receiver for the debenture holders, and the sums advanced by the Shanghai Co. have been repaid.

Cawnpore Electric Supply Corporation, Ltd.

The surplus on working during 1923 was £46,319, and, after deducting debenture interest and adding £667 brought forward, there was an available balance of £33,273. £2,264 is transferred to reserve for depreciation and renewals; the general reserve receives £4,990; £710 is written off investments, and £1,031 off the cost of the new share issue. These deductions and the interim dividend on the ordinary shares and the preference dividend left a balance of £13,817. It was proposed to deal with this as follows: Final dividend of 7 per cent. on the ordinary shares (making 10 per cent. for the year); to be carried forward, £2,167. The directors have transferred £13,500 from the general reserve to meet taxation. The meeting was held on Wednesday last.

Northern General Transport Co., Ltd.

The annual meeting of the company was held on May 22nd, under the chairmanship of Mr. R. J. Howley, C.B.E. In moving the adoption of the report and accounts (*vide* ELEC. REV., May 16th, p. 806), the Chairman said that the issued share capital had been increased during the year by the issue of 41,291 six per cent. preference shares and 22,886 ordinary shares of £1 each, and the proceeds had been employed in the reduction of loans from bankers and others from £98,000 to £28,470. The Gateshead and Tynemouth companies did well during the year, but the Jarrow company was still feeling the effects of the depression in the shipbuilding industry in the district.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Brompton and Kensington Electricity Supply Co.—1,515 ordinary shares of £1 each, fully paid, Nos. 290,311 to 291,825.

The undermentioned have been ordered to be officially quoted:—

Brompton and Kensington Electricity Supply Co.—1,515 ordinary shares of £1 each, fully paid, Nos. 290,311 to 291,825.

Lima Light, Power and Tramways Co.—£1,250,000 6 per cent. first mortgage debentures, in lieu of the scrip, together with £250,000 6 per cent. first mortgage debentures (issued abroad). Nos. 1 to 155 (£1,000), 156 to 1,655 (£500), 1,026 to 7,945 (£100), and 7,946 to 18,845 (£20).

Tata Power Co.—£750,000 7½ per cent. "B" mortgage debenture stock.

Glenfield & Kennedy, Ltd.—Dividend of 5 per cent., less tax, on ordinary shares.

Alderley and Wilmslow Electric Supply Co., Ltd.—The gross profit for 1923 was £8,377, as compared with £7,244 in 1922. After deducting debenture and loan interest, the cumulative preference dividend, £2,800 for depreciation and renewals, and provision for income tax, and adding £744 brought forward, there remained a balance of £2,612. This was distributed as follows:—Dividend of 8 per cent., free of tax, on the ordinary shares, £1,461; to general reserve fund, £500; and carried forward £651.

Barnsley and District Traction Co., Ltd.—The revenue for 1923 was £144,779, and after providing for loan and debenture interest, and reserving £22,600 for renewals, there remains a balance of £25,151, to which is added £14,605 brought forward, making £39,756. The directors proposed to place £10,000 to reserve, to pay a dividend of 15 per cent., free of tax, on the ordinary shares, and to carry forward £20,571.

Yorkshire (Woollen District) Electric Tramways, Ltd.—The report for 1923 records a revenue of £145,854. The balance, after providing for debenture and other interest, and placing £20,700 to renewals, is £28,842, and to this is added £16,095 brought forward, making £44,937. The directors proposed, at the meeting on May 28th, that £5,000 should be transferred to reserve, and that a dividend of 6 per cent. should be paid on the ordinary shares, leaving £27,595 to be carried forward.

The Swedish-Russian Telephone Company.—The directors of the Swedish-Danish-Russian Telephone Company report that negotiations were continued in 1923 with the Russian authorities with regard to an agreement concerning the Moscow telephone network, but without any result. The accounts are reported to show a loss of 4,200,000 kronen for 1923 as compared with a loss of 1,200,000 kr. in 1922, thus increasing the total loss to 10,840,000 kr.

Madras Electric Supply Corporation, Ltd.—The net profit for 1923, after providing for interest on debentures, depreciation and renewals, taxation, and the amount of sinking fund for redemption of 6 per cent. first mortgage debentures, was £27,538, plus £8,038 brought in, making £35,576. The directors recommend a dividend on the ordinary shares of 8 per cent. (free of tax), carrying forward £6,240.—*Financial Times.*

Companies to be Struck off the Register.—The names of the following companies will be struck off the register at the expiration of three months, unless cause is shown to the contrary:—

Carbone Arc Lamp Syndicate, Ltd.
M.E.C. Electrical Co., Ltd.
Porous Accumulator Co., Ltd.

Mirrlees, Bickerton & Day, Ltd.—The net profit for 1923, after provision for depreciation and the payment of directors' fees, was £25,946. The addition of £3,390 brought forward makes available £29,337. It is proposed to pay a dividend at the rate of 7½ per cent. on the ordinary shares, to place £5,000 to reserve, and to carry forward £6,779. The meeting is to be held to-day (Friday).

Lewes and District Electric Supply Co., Ltd.—The net profit for 1923 was £3,476, and to this was added £1,956 brought forward, making £5,432. It was proposed to pay a dividend of 7½ per cent. on the ordinary shares, to transfer £1,000 to reserve, and to carry forward £2,686.

North Wales Power and Traction Co., Ltd.—The total profit for 1923 was £38,439. Interest on debentures and loans required £37,637, and a sum of £1,883 was brought forward, making the net balance £2,686.

American Telephone and Telegraph Co.—Dividend of 2¼ per cent. on the capital stock for the past quarter.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange business continues to be reasonably active in the investment markets, though in speculative areas, activity is far to seek. The speculator is timid of venturing into markets that are so liable to be shaken by erratic exchange movements and by political disturbances that are still apparent, in South Africa, for example, and in other parts of the world. The settling-down of India is certainly a matter that will cause gratification to the wide circles of British people who have invested money in the Dependency's industrials, and this satisfaction is reflected in fairly substantial rises which have occurred during the past few business days amongst Indian stocks and shares.

Once again, the confidence of proprietors of cable stocks and shares is being shaken by the wireless developments. These nerve attacks have been felt, in varying degrees of acuteness, for the past five-and-twenty years, and it may be that most stockholders in the cable companies are case-hardened against wireless apprehensions. Nevertheless, there are always a few folk who are apt to be upset by Marconi possibilities, and sales on behalf of such proprietors are leading to dulness in the prices of this group.

The annual report of the Great Northern Telegraph Co. of Denmark frankly acknowledges that wireless competition is becoming formidable. The Norwegian-American route proved susceptible to this competition, and the company lowered its rates, with the result that a considerable part of the lost traffic was regained, but traffic between Scandinavia and France, the bulk of which formerly passed over the company's cables, is now going *via* wireless. Great Northern shares have accordingly fallen 10s. to 29½. Eastern ordinary shed 4 points, Western Telegraphs are 10s. lower, Eastern Extension 7s. 6d., and Globes 5s. Anglo-American deferred has gained 5s., the prospect of trans-Atlantic telephony holding no terrors for the present.

Meanwhile, the Marconi Company has issued a statement this week to the effect that no interim dividend is to be paid in respect of 1923. Nothing is said about a final dividend: we leave our table of yields unchanged, only observing that the 15 per cent. dividend is in respect of 1922. Terms of reference in the arbitration in respect of the company's claims against Government departments have been drafted and settled by the Government counsel. These terms are now awaiting final approval before submission to the company. The board states that experiments on the new system of long-distance wireless telegraphy have been brought to a point at which it is possible to say with confidence that it will revolutionise the practice of long-distance wireless telegraph communication. This had the effect of causing the shares to harden to 1 9/16. Marconi Marines advanced at the same time to 24s. 6d. Canadians remain a dull market.

There is not much doing in electricity supply shares. Charing Cross ordinary fell back to 41s. 6d. and Westminsters to 10½. Urban ordinary recovered to 18s. 9d. x.d. These are the only changes in the list of home shares. It is not to be assumed, however, that interest in the electricity supply group has evaporated. On the contrary, attention is more than ever directed to what is likely to happen in the near future. Pending developments, people are not going to buy or to sell. Whitehall Electric preference strengthened to a guinea.

The manufacturing group is steady. General Electrics are better at 19s. 9d. The feature, however, is the manner in which the shares of the cable manufacturing companies have gone ahead. Callenders, Henleys and British Insulated are all higher on the week, for which the excellent results shown by Callender's company are mainly responsible. The dulness in cable stocks has no effect upon the shares in these companies, the preference shares of which are also in demand, a considerable business being done in Callender's 7½ per cent. "B" preference at the advanced price of 26s. The investor will do well to turn his attention to Enfield Cable 7½ per cent. preference, the price of which is 24s. *cum* a half-yearly dividend due on July 1st. At this price, the yield is a little over 6 per cent. on the money, and, with the company under its present management, success is virtually assured. The preference dividend is well covered, and the shares make a useful investment.

Home Railway stocks are inclined to be dull. Metropolitans have gone back to 81, in spite of the crowds present at the Empire Day celebrations, on Saturday and Sunday last, at the Exhibition. In Districts, business is very quiet, the stock remaining at 53, and Underground Electric Railway issues are neglected.

London United Tramways preference, which were almost unsaleable a little while ago, have risen to 4s., on the prospect of the company's receiving some kind of favourable treatment as a result of the present Commission which is sitting upon traffic control. The same reason was instrumental, as already mentioned, in putting up the price of London and Suburban Traction preference, which have gained another shilling this week to 7s. 6d., after touching 8s. 3d. British Electric Traction ordinary put on another 2 points at 86, thanks to the increase in the dividend.

Anglo-Argentine Trams are unaffected by a report which will be read with mixed feelings by the shareholders. In spite of there being a large increase in the number of passengers carried, the earnings of the company have gone back £50,000 to 4½ million pounds sterling. The net profit comes out at £339,800, a reduction of nearly £190,000. This profit does not suffice to pay the second preference dividend in full, and the sum of £20,000 is transferred from contingencies reserve in order to maintain the distribution. No change has occurred in the price of the shares. The 5 per cent. debenture stock at 71½ is ex dividend.

Iron and steel shares improved, with Vickers leading the way, in spite of the dividend on the company's ordinary shares having been passed for last year. There has been, however, a good deal of bear covering, and this applies to other shares in the list. Babcock & Wilcox are lower at 46s. 3d. Rubber shares are better, a drop to 9½d. per lb. in the price of the produce being followed by a recovery to nearly 11d. Hopes and prices immediately rose, and there is a good deal of inquiry for cheap stock.

Various "dollar" stocks are higher on reflection of the American rate of exchange. Kaministiqua Common at 122 and Montreal Light, Heat and Power at 186½, have both advanced. Mexican Utilities show no variations and Brazilian Tractions, after being higher and lower, came back to 56½, the same price as that of a week ago.

Share List of Electrical Companies.

	Nom. £	Dividend. 1922.	Dividend. 1923.	Price May 26, 1924.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Brompton Ordinary	1	12	10	37/-	—	*£5 8 1
Charing Cross Ordinary	1	14	14½	41/6	—1/-	6 19 9
do. do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	10	12	36/3	—	6 12 7
City of London	1	15	15	45/9	—	6 11 0
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
County of London	1	10	15	47/-	—	6 7 8
do. do. 6 % Pref. ...	1	6	6	1½	—	5 6 8
Edmundson's Ordinary	3	7	7	5	—	4 4 1
do. 6 % Pref.	5	6	6	5½	—	5 17 1
Kensington Ordinary	5	12	14	10	—	7 0 0
London Electric	1	10	10	31/-	—	6 9 0
do. do. 6 % Pref. ...	5	6	6	5⅞	—	5 1½ 7
Metropolitan	1	8½	10	1⅞	—	5 14 3
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary ...	1	2½	6	18/9	—	6 8 1
do. 5 % Pref. ...	1	5	5	17/-	—3d.	5 17 8
do. 7 % Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	21/3	—	5 13 0
Urban Ordinary	1	—	4	18/9xd	—	4 5 8
do 6 % Pref. ...	1	5	6	1	—	6 0 0
St. James' and Pall Mall ...	5	14½	17½	13½	—	6 13 4
South London	1	11	15	42/-	—	6 7 2
South Metropolitan Pref. ...	1	7	7	1⅛	—	5 12 0
Westminster Ordinary	5	12	15	10½	— ½	7 2 10
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	21/-	+6d.	7 2 10
HOME RAILS.						
Central London Ord. Assented Stock	4	4		68½	—	5 16 10
Metropolitan ... ... ,,	3½	4		81	—1	4 18 9
do. District ... ... ,,	3	3½		53	—	6 12 1
Underground Electric Ordinary	10	Nil	Nil	2⅛	—	Nil
do. do. "A" ...	1	Nil	Nil	8/-	—	Nil
do. do. Income Bonds	5	6		95	—	*6 6 4
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 6
do. Def. ... ... ,,	1½	34/6		23½	+ ¼	6 6 4
Chile Telephone	5	6	6	6	—	5 0 0
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension...	10	10	10	17	— ⅛	5 17 8
Eastern Tel. Ord.	Stock	10	10	170½	—4	5 17 4
Globe Tel. and T. Ord.	10	10	10	17½	— ¼	5 12 8
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	24	22	29½	— ½	7 10 6
Indo-European	25	10	7	33½	—	*5 6 1
Marconi	1	25	15	1⅞	+ 1/8	9 12 0
Oriental Telephone Ord.... ...	1	12	12	1⅛	—	*6 8 0
United R. Plate Tel.	5	8	8	7	—	*5 14 6
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	16½	— ½	5 19 5
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref. ...	5	5½	12½	8⅛	—	8 9 0
do. do. 2nd Pref. ...	5	Nil	5½	2⅛	—	10 4 4
do. do. 5% Deb. ...	Stock	5	5	71½xd	—	6 19 10
British Electric Traction Ord. ...	,,	4½	5	86	+2	6 19 6
do. do. 6% Pref. ...	,,	6	6	101	+1½	5 18 10
Brazil Traction	100	Nil	4	56½	—	7 1 8
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	86½	+1	5 15 7
do. do. Preferred	,,	5	9/-	83½	+1	*5 11 9
do. do. Deferred	,,	8	127/-	104	—	*6 3 9
do. do. Deb.	,,	4½	4½	80½	+2	5 5 7
Lond. & Sub. Trac. 5 % Pref. ...	1	8½	5	7/6	+1/-	8 13 4
London United Tram. Deb. ...	Stock	4	4	47	—	8 10 2
Mexico Trams. 5% Bonds ...	—	Nil	Nil	73½	—	6 16 0
do 6% Bonds ...	—	Nil	Nil	50½	—	Nil
Mexican Light Common ...	100	Nil	Nil	22½	—	Nil
do. Pref.	100	Nil	Nil	47½	—	Nil
do. 1st Bonds ...	—	Nil	5	68½	—	7 6 0
MANUFACTURING COMPANIES.						
Babcock & Wilcox...	1	15	20	2⅞	+ ¼	*5 4 0
British Aluminium Ord.... ...	1	10	5	24/6	—6d.	4 1 8
British Insulated Ord.	1	15	15	51/3	+9d.	5 17 0
Callenders	1	15	15	52/6	+ ⅛	5 14 3
do. 6½ Pref....	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	10	5	⅞	—	8 17 10
Edison-Swan	4/-	Nil	7½	5/-	—	6 0 0
do. ,, 5% Deb.	Stock	5	5	78½	—	6 7 5
Electric Construction	1	10	10	1⅝	—	6 7 5
English Electric	1	8	5	16/3	—6d.	6 3 1
do. do. Pref.	1	6	6	19/-	—	6 6 4
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
do. Ord.	1	10	5	19/9	+ 6d.	5 1 8
Henley	1	15	15	51/3	+ 6d.	5 17 0
do. 4½ Pref.	5	4½	4½	4½	—	5 9 1
India-Rubber	1	10	10	1½	—	*7 5 6
Met.-Vickers Pref....	2	8	8	2⅞	—	6 11 2
Siemens Ord.	1	10	10	18/3	—	Nil
Telegraph Con.	12	20	20	24	—	*5 0 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price May 27.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5½d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£35	...
a Copper Sulphate ... ... ,,	£35 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	4½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ... ,,	£7 15s.	...
a ,, Roll ... ... ,,	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4½d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£125 to £130	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net	£213	...
Grade II ... ... ,, ,,	£152	...
Grade III ... ... ,, ,,	£85	...
c Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	¼d. dec.
c ,, Tubes (solid drawn) ... ,,	1/- to 1/0½d.	¼d. dec.
c ,, Wire, basis ... ... ,,	9¾d.	¼d. dec.
c Copper Tubes (solid drawn) ... ,,	1/1¼d.	¼d. dec.
c ,, Bars (best selected) ... per ton	£91	£2 dec.
c ,, Sheet ... ... ,,	£91	£2 dec.
c ,, Rod ... ... ,,	£94	£2 dec.
d ,, (Electrolytic) Bars ... ,,	£97	£2 dec.
d ,, ,, Sheets ... ,,	£143 10s.	£2 dec.
d ,, ,, Wire Rods ,,	£77	£2 dec.
d ,, ,, H.C. Wire per lb.	9⅞d.	¼d. dec.
f Ebonite Rod ... ... ,,	2/- to 3/6	...
f Sheet ... ... ,,	2/- to 3/6	...
a German Silver Wire ... ... ,,	2/3	...
h Gutta-percha, fine ... ... ,,	nom.	...
h India-rubber, Para fine ... ,,	11½d.	...
Iron Pig (Cleveland Warrants) ... per ton.	£5 2s. to £5 2s. 6d.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£25	...
g Lead, English Pig ... ... ,,	£31	5/- inc.
g Mercury ... ... per bot.	£13 5s. to £13 10s.	...
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/8½	½d. dec.
p ,, ,, rolled strip & sheet ,,	1/3½	...
p ,, ,, wire ... ... ,,	1/3½	½d. dec.
e Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/6½	...
r Steel, Magnet, in bars ... ... ,,	8d.	2d. dec.
n Tin, Block (English) ... ... per ton.	£209 10s. to £210	£17 dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/3	3d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Belling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Type R27 Aeronautical Radio Receiver.—An illustrated booklet has been issued by the Air Ministry (Air Publication 1,073; H.M. Stationery Office, price 6d. net), giving a full description of the construction and method of operating the type R27 multi-circuit radio receiver. The unit is a tuner only and is designed with a view to providing a specially selective receiving circuit for use in conjunction with a receiving-amplifier, such as the type A. 26 or A. 33. It is intended for use on the ground and the wavelength range covered is approximately from 200 to 20,000 metres (1,500 to 15 kilocycles). The unit comprises four separate circuits arranged to be tuned independently, the coupling between them being electrostatic. The circuits are magnetically screened from each other and are all contained within the same screening outer case. The four circuits can be divided into two main divisions:—(i) The aerial tuning circuit; and (ii) three closed tuned circuits similar to each other, the coupling to the aerial circuit and between each of the closed circuits being variable. The aerial circuit alone, or in conjunction with one, two, or three of the closed circuits can be used in accordance with the degree of selectivity required, a plug and flexible lead being provided for selecting the number of closed circuits to be used. The three tapped inductances of the closed circuits, though electrically independent, are simultaneously adjusted by means of a single handle. A separate heterodyne must be used for the reception of c.w. signals, a type S. 36 syntoniser being suitable for this purpose.

The Metric System for Japan.—According to the *Daily Express*, Japan will adopt the metric system of weights and measures on July 1st.

Out for the Domestic Business.

By L. L. ROBINSON, M.I.E.E., M.Inst.C.E., Borough Electrical Engineer, Hackney.

(*Concluded from page* 827.)

The Need for Educating the Public.

Such accounts as are written by the more intelligent representatives all emphasise the points which I have laid down in the commencement of this article, namely, that the hardest thing we are up against is the ignorance of the public and the need for constantly educating them. I will conclude with a few extracts from such accounts:—

The majority of amusing conversations which I have had have been brought about by the ignorance of the prospective consumer of electrical expressions, as in the case of a wealthy but illiterate Jew whom I called on recently. I was taking details for a lighting installation at his house, and when we came to the best bedroom he told me that he wanted a bulb over the dressing table and a bulb over the bed, with a separate plug for the former and two plugs for the latter.

After we had been talking at cross purposes for some time I discovered that what he really meant was a plain pendant over the dressing table to be controlled by one switch, and a plain pendant over the bed to be 2-way switched from bedside to door.

One thing that seems strange to me in connection with house-to-house canvassing for mains extensions is the remarkable uniformity of the answers of the people so canvassed.

If they are to be believed, then:—

65 per cent. of them have just bought complete sets of new gas fittings.

25 per cent. of them are just going to move.

9 per cent. of them promise to consider the matter (but rarely do so).

1 per cent. of them are (or say they are) satisfied with gas.

Is there a secret society for combating supply undertaking canvassers, or are the ladies afraid that if they let the handsome, well-dressed canvasser into the house to more fully discuss the pros and cons of the electrical idea, he will turn out to be some desperate criminal who called with the pleasant intention of murdering them or stealing the family heirlooms (or both)?

Another difficulty we are up against is the inability of the general public to disassociate certain features of gas from electricity, and I am inclined to think that there are some folks who prefer a "tube" job to a C.T.S. or metal-sheathed job, because they think they will get a better pressure through the larger tubes.

I was told by a lady of the trouble she was having with the gas mantles breaking, through a draught, and was asked whether this would be so with the electric lights.

Another wished to know whether, if a lamp was taken out, the electricity would escape.

When taking details of wiring for a cooker, I was told the light was already in the kitchen, and the consumer was surprised when told we must run new cables to supply the cooker.

I was once asked not to use tubes, because they already had enough smells from gas pipes.

Some people are never satisfied. I remember calling upon a man who wanted a prepayment installation. He appeared surprised when I told him what was allowed, and that the extra switches, plugs, fittings, lamps and shades would be extra. He also told me where to fix the meter, and finished up by saying, "Well, governor, if I can't have what I want I shall have nothing."

How Canvassers are "Received."

Perhaps the most important fact that impressed me when first calling on consumers and prospective consumers in this district was the difference representing an undertaking like the Hackney Borough Council made to the reception I received when making an initial call. The front door is usually partially opened by a maid or the lady of the house, who, seeing you on the doorstep with an attaché case in your hand, eyes you with suspicion and disapproval, thinking, no doubt, that you want to sell her something new in toilet soaps or mouse traps, but upon handing her your card a very different look usually comes over her face, and she is prepared at any rate to hear what you have to say, and usually shows some interest and feels that she has at least to be polite to a borough council representative.

However, representing the council has not always had its advantages, as on several occasions I have been asked into the hall and met by an irate ratepayer who demanded an explanation as to why the dustman had omitted to call the previous week.

I was rather surprised while walking along one of the principal roads one afternoon, when a window was suddenly opened by a lady who wanted to know if I had any postcards. Why she should have thought I was hawking stationery is a mystery, and unfortunately I was unable to persuade her to have an iron or vacuum cleaner instead of cards.

A Tale of a Dog.

I well remember on one of my calls, being requested by a good lady to hold her dog to prevent his running out into the street while she went to find her husband whom I had called to see. As the dog looked quite innocent, I volunteered to hold him, but it soon became very apparent that if I wasn't careful the dog would hold me, and considering discretion the better part of valour, it was not long before I allowed "Fido" to run out into the street.

On another occasion when being taken by the lady of the house to inspect a faulty radiator, we found her husband asleep in the room, and, being disturbed, he made some very rude remarks about electricity in general and his wife in particular. Being a foreigner he soon exhausted his English vocabulary and broke into his native tongue, and after I had made a brief examination of the faulty fire I made a hasty retreat and left husband and wife to carry on their heated argument.

About 50 per cent. of the consumers that I have interviewed *re* heating and cooking insist on talking to me about "electric gas fires" and "electric gas stoves," and one good lady "couldn't possibly understand why I couldn't connect an electric cooker to her existing gas-stove pipes."

Organised Canvassing Pays.

Canvassing a road or district, although at times rather a heartbreaking job, and taking up a fair amount of time, in my opinion can never be considered waste of time, and although results may be small at the moment, cannot fail to bear fruit later. Quite a number of people I find, although knowing the many advantages of electricity, have never associated it with their own homes, and it is not until the proposition is put before them that they begin to think of it at all, but once you impress the idea upon their minds the battle is half won, especially if you can inform Mrs. Brown that her neighbour, Mrs. Jones, is going in for it.

Cooker Comments.

From a lady who works all day, and has no time to cook:—

She puts in her joint before going to bed, at "low" heat, and it is finished in the morning ready to eat. It is quite safe to leave it all night without watching it.

Another lady thinks electric cooking is slow, as the joint took three hours to cook. On questioning the lady, found she had the door open all the while to see how it was getting on.

One client who has suffered many years from acute indigestion is quite cured since she has cooked by electricity.

One foreign lady threatens to have the cooker taken out if we do not replace the kettle, which she burnt out before she had it a week.

"Electric cooking is the most efficient form of cooking on the market," says a North Country lady; "I have tried all methods and have never attained such splendid results until I had electricity installed."

From a Council house:—

"Since I have had an electric cooker installed, I find my work in the morning far easier than before. My little girl of 10 is now quite an efficient cook, and I do not mind her using the cooker, as it is *so safe*, as there is nothing to catch fire. I would not go back to gas again for any consideration now."

A train-driver's "missis" says she thinks electric cooking is expensive—her bill works out at 1s. 3d. per week for herself, husband, and four children. She has a good-sized cooker and electric kettle. What would be the cost if it were gas? Not less than this.

A butcher's wife says:—

"If only more people would cook with electric ovens we should do away with most of our complaints; it is not the meat that is tough, but the way it is cooked makes it so. In electric cooking the meat is tender and has a much better flavour than that cooked in a gas oven."

One lady on whom I called can neither read nor write, and speaks very little English, being Russian. Having spent a very weary morning trying to teach her, parrot-like, to use the different switches that control the cooker, I left her with a feeling of despair, thinking the cooker would have to be removed for sure before very long. After giving her a few days to get into the way of the stove, I called again,

and was met with a large smile on the face of the very large lady. "The cooker very good, bonne," said the lady. She had managed quite well by touch and a little common sense, the cooker being so simple that a child can easily work it after having been shown once or twice. She had cooked a very successful dinner.

Having spent a busy morning helping a nice little Lancashire woman to cook her dinner on her new electric cooker just installed an hour before, I hurried away to get some lunch, and as I left the house she ran back into the kitchen, saying, "Wait a minute, Missie, here's something for you, dear," and pressed a shilling into my hand. "I do be so pleased with my new cooker, and you 'ave been kind," and before I could gather myself together, I found myself gazing at my open palm and the tip she had thrust into my hand, the door closed and my good friend disappeared.

The British Industries Fair.

Birmingham Section.

(*Concluded from page* 857.)

Messrs. Sturge & Baker, Ltd.

This firm showed a number of electric fires, all of which employ a special form of element—a circular boss upon the face of which a coiled element is placed in parallel rows. The result is a widely diffused heat when the element is used in a "flat" type of fire. Very good results are obtained when the boss is employed in the bowl-pattern fire. The bowl heaters shown included a miniature type not more than six inches in diameter. Apart from the fires the firm showed numerous electrical fittings, including all-porcelain tumbler switches, spherical cord absorbers for use with flexibles, and a selection of lighting fittings.

The Crosthwaite Engineering & Furnace Co., Ltd.

On this stand was displayed and demonstrated a mechanical stoker and self-cleaning furnace. This apparatus is claimed to ensure complete combustion of fuel, elimination of smoke without the admission of excess air, freedom from breakdowns, and a minimum of attention. The gear is illustrated in fig. 3. The fuel is fed into the hoppers at the bottom of which is a

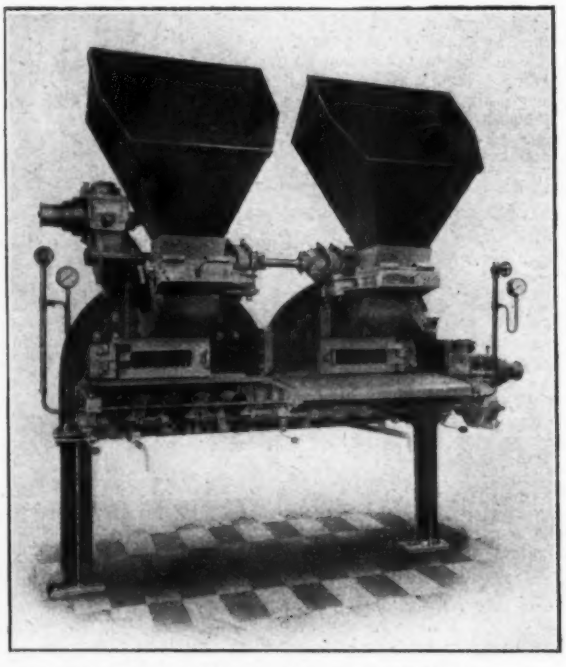

Fig. 3.—The "Crosthwaite" Mechanical Stoker.

feeder slide which has a backward and forward motion actuated by a cam on a motor-driven shaft. By means of a simple screw and nut arrangement the stroke of the feeder can be easily regulated to suit any rate of combustion, without stopping the stoker. The fuel, in small quantities, is pushed by the feeder over the edge of the feedbox on to a firing nose and is divided during the same process. It is then thrown on to the grate by means of a swinging shovel. The latter is carried by a single central arm which swings in a passage directly through the centre of the feedbox. The arm is carried on a horizontal shaft, which also carries at one end a curved cam lever fitted with a nickel-chrome steel roller; at the other end is a spring lever attached by means of a spring to a bracket on the feedbox. The curved cam lever is operated by a three-point finger cam mounted on the driving shaft. This is not keyed and is therefore free to rotate in advance of its normal position on the shaft. When the cam is bringing the shovel to the back position against the tension of the spring, it is driven by a pin from the feeder cam and immediately the roller reaches its extreme limit the cam flies forward, giving the cam lever freedom to swing clear of the cam and give the spring full play to actuate the shovel. The furnace is of the reciprocating type, the grate being divided longitudinally into close-fitting sections, each a separate unit. Each section of the grate is driven by independent cams which are fitted to a hexagonal shaft at the front of the furnace. The cams work on to wearing pieces which are secured to the air injectors. The forced draught is created by steam jets, one to each section. The grate sections are carried at the front on a girder, which, in turn, is carried on cast-iron pillars fitted to the floor. Thus the weight of the stoker is not carried by the front plate of the boiler. The grate is carried on a strong cast-iron bridge, which is fitted with a hinged door for clearing out the clinker. The stoker and self-cleaning furnace are driven by separate gear boxes and are thus entirely independent of one another.

The Falkirk Iron Co., Ltd.

Several models of electric cookers were exhibited by this company, including two new designs. One of these, the "Midget," is illustrated in Fig. 4. This has a cooking space 14 in. wide, 14 in. deep, and 12¼ in. high, fitted with side heating elements rated at a maximum of 1,500 W with heat regulation. The switch is fitted underneath the oven, together with a combined switch plug which conveys current to the breakfast cooker supplied as part of the equipment and shown in the illustration. This little cooker has a 1-kW loading

Fig. 4.—The "Falco Midget" Cooker.

controlled by a two-way indicating switch. It is 11 in. wide, 8¼ in. deep, and 4¼ in. high. Another new design shown was the "Cottage" cooker, which is a development of the "Midget" pattern. The utility of the latter is increased by the addition of a standard hob carrying a combined grill and boiler plate element of 1,500-W capacity. The "Pagoda" model is of rather novel design. It has a 2,000-W total loading and ample shelf and plate-warming accommodation. In addition to the cookers the company displayed hot plate irons, fires, &c.

Messrs. M. B. Wild & Co., Ltd.

EXAMPLES of haulage gear were shown by this company. One example was a single-drum haulage driven by a 20-h.p. electric motor through "Spence-Wild" patent reduction gear. The last consists of a duplex worm drive, with a further reduction by spur wheels. The thrustless worm gear consists of a collarless shaft having right- and left-hand worms gearing into their respective wheels. These rotate in the same direction, being mounted on opposite sides of the worm-shaft, and with the latter floating end free they cannot get out of balance. The second reduction consists of two pinions gearing into a common spur wheel keyed on the final speed shaft. The worm wheels are mounted on the pinions. With this two-point drive the size of the spur wheel is considerably reduced, and while relieving the bearing pressure it does not increase the stress. A cross-coupling is fitted between the worm shafts to allow an endwise movement, enabling the load to be equally distributed. The complete assembly is housed in an oil-tight cast-iron box, presenting a neat and compact appearance. The gears are made in standard sizes up to 100 h.p.

Messrs. Smith & Paget, Ltd.

Among a number of washing machines of various patterns this firm showed the "Northern Crown" electric washer. This machine is of the reversing cage type, having a perforated barrel which rotates one and a half revolutions in either direction alternately. The motor is mounted on a small extension of the machine stand and drives the washer mechanism by means of a chain which is totally enclosed. The mechanism is put into gear with the motor by means of a lever at the side of the machine. Rollers of adequate size (24 in. long and 6 in. diameter) are fitted in the mangle, and these have a simple reversing arrangement operated by a pedal. An automatic finger guard, by means of which the machine can be instantly stopped, is provided.

Mr. Edward Bouchery.

The principal feature of this stand was the adaptation of the "Nectra" hand-driven washer to electric drive. This is accomplished in two ways, *viz.*, by the provision of a motor fixed underneath the body of the washer with a belt and friction wheel drive to the main washer wheel, or, as illustrated in fig. 5, by an arrangement of gears driven by a motor mounted on a bracket projecting from the tub. The latter is probably the more efficient owing to the positive nature of

Fig. 5.—The "Nectra" Washing Machine.

the drive, although double transmission is introduced. The chief point regarding this type of washer is its price as compared with the "proper" electrical washing machine. The principal part of the cost is entailed in the motor, which need only have an output of .2 or .25 h.p. The washing is performed by a pair of pin-jointed wooden beaters secured on a vertical spindle in the interior of the tub. To these is imparted a reversing rotary motion and at the same time the beaters are raised and lowered in the tub.

Messrs. J. H. Tucker & Co., Ltd.

As at previous Fairs, this company had a large display of switchgear of many types. Included in this were examples of quick-make-and-break ironclad switches and fuses. These have mica-insulated steel coupling bars and contacts of special design. Iron and teak-cased fuse and distribution boards for domestic and industrial use were shown in considerable variety; all the woodwork is made in the firm's own cabinet shop. Examples of accumulator charging boards for private house lighting sets were also shown. These are of standardised designs, making any combination of switchgear and instruments easy to carry out. In the combined switches and fuses shown interchangeable and removable adaptors are provided to facilitate wiring. These may either have one central hole for bunched cables, or separate holes for each lead, tapped for conduit or bushed for paper-insulated cable, with recessed bodies for sealing the cable ends. The tumbler switches of the quick-make-and-break pattern which were shown, are remarkable for their generous allowance of metal and the encased compression spring positive drive throughout the stroke. A new type of flat switch for sunk work with a special small base was among the exhibits. Other appliances which appeared on the stand were ceiling roses, lamp holders, wall plugs and sockets, bell pushes, china cut-outs, &c.

The Wandsworth Electrical Manufacturing Co., Ltd.

Many small lighting and power accessories were shown by this company. The principal items were a series of quick-make-and-break tumbler switches, and automatic switch plugs embodying the same principle. The latter are so constructed that the circuit is always made and broken by the switch, but not until the plug is well into the sockets or before the plug is clear of them. Thus there can be no sparking on the plug pins, the socket is always "dead" when the plug is withdrawn, and the switch cannot be left in an intermediate position. Other exhibits were switch-boxes for sunk work, "Admiralty" pattern plugs and sockets, cut-outs, ironclad fuseboards, ceiling roses, &c.

Mosely Installations, Ltd.

This firm showed a combination electric water heater and towel rail. This device consists of a water heater in the form of a double tube, each with its own element. The water enters at one end of the lower tube and proceeds through this, up a connecting pipe, and along the upper tube to an outlet pipe. The tubes are nickel plated, and have a combined loading of 4-kW. With the two rails as described a flow of 20 gal. per hour at a temperature of 145 deg. is obtainable. The device is also made with a single tube or three or more tubes.

Messrs. F. Gilman (B.S.T.), Ltd.

On this company's stand a number of boiler-scaling appliances were exhibited and operated. These were of three main types—electrical, pneumatic, and petrol-engine driven. The demonstrations were carried out upon encrusted boiler tubes and showed in an effective manner the action of the tools.

Messrs. W. & T. Avery, Ltd.

A number of testing machines appeared on this stand, including appliances for torsion and fatigue tests, a 30-ton "universal" testing machine, cement-testers, &c. A balancing apparatus for armatures and flywheels was also shown. A motor-driven coal-loading totaliser and recorder for use at collieries was another exhibit. One novelty which was exhibited consisted of a combination of a visible-index weighing and price-calculating machine for a butcher's or other shop with two electric signs. By means of a special switching device the illumination of the scale also brought into circuit one or both signs, or the signs and scale could be illuminated independently of one another.

The Wolseley Sheep Shearing Machine Co., Ltd.

In addition to a number of petrol-engine operated sheep-shearing and horse-clipping appliances, cream separators, and other farm apparatus, this company showed a 2-kW lighting set in which the generator was directly coupled, with an intermediate flywheel, to a petrol engine.

Mr. R. M. Catterson-Smith.

On this stand were shown examples of radiant electric furnaces for temperatures not exceeding 1,000 deg. C. These are fitted with nichrome wire elements and control is effected by a rheostat fitted between the legs on which the furnace is mounted. At the back is fixed a replaceable safety thermal cut-out. These furnaces are suitable for laboratory work, tool hardening, enamelling, and optical glass annealing.

Other Exhibitors.

In addition to the above, exhibits of direct or indirect electrical interest were displayed by the following:—

THE RAWLPLUG CO., LTD. ("Rawlplug" applications and aluminium fittings); Messrs. C. H. PARSONS, LTD. ("Britmac" tumbler switches and lampholders in a variety of finishes); Mr. T. SAVEKER (lighting fittings); Mr. J. SINGLETON (lighting fittings); ACCUMULATORS (BIRMINGHAM) (automobile and radio batteries); ARC LIGHTS, LTD. (electric lighting bowls); Messrs. WILKINS & WRIGHT, LTD. (lighting fittings); THE M.A.P. CO. (radio components); HOCKLEY CHEMICAL CO., LTD. (electro-plating apparatus); THE PARAGON RUBBER MFG. CO. LTD. (radio and electrical insulated components); BRITISH ELECTRICAL REPAIRS, LTD. (examples of re-wound armatures, &c.); FEED WATER SPECIALISTS CO. (colloids for boiler-feed treatment); JOHN THOMPSON (WOLVERHAMPTON), LTD. (boiler sections and models); Messrs. H. W. BAINBRIDGE & CO., LTD. (brass and bronze pressings for electrical fittings); THE STEAM GAUGE MFG. CO. (pressure gauges and steam-pipe fittings); Messrs. H. R. BLOOR & CO. (malleable and grey iron and stamped conduit fittings); and Messrs. S. A. LAMPLUGH, LTD. (radio components).

German-Austrian Co-operation.—It is reported from Vienna that the Austrian Dynamo Works Company has entered into an agreement with the Lloyd Dynamo Works Company, of Bremen, under which the former will manufacture the types of dynamos made by the latter. At the same time the Austrian company will represent the interests of the German company both in Austria and the Balkan countries.

Heavy-Current Turbo-Generators.

A 7,140-kVA, 525-Volt Brush-Ljungström Turbo-Generator.

In recent years many articles have been published giving particulars of alternators designed for high pressures, but the low-pressure alternator with its consequent heavy current has been somewhat neglected. There is, however, a considerable field of utility for such machines, particularly where the load is situated near the generating plant; also, if their use can be justified, technically and commercially, they can be used where it is desired that the outgoing pressure shall be higher than the generated pressure.

An interesting example of a low-pressure turbo-generator has been running for some time in a large textile mill in Scotland with satisfactory results, and a duplicate set has now been installed. The set consists of a Brush-Ljungström turbo-generator, having an output of 7,140 kVA, 3-phase, at 50 periods, 525 volts, power factor 0.7, with an overload capacity of 25 per cent. for two hours. The current per phase is 8,000 amperes.

The Brush-Ljungström turbo-generator possesses natural advantages when required for low voltages, in that the total output is divided between two alternators. The limit in output for efficient design at a predetermined pressure is therefore twice that of a turbo-generator with a single alternator.

The current per phase of each alternator is 4,000 amperes, and as it is impossible to subdivide the winding to any extent, a heavy current per slot is unavoidable. Special precautions, therefore, have to be taken to avoid eddy currents and overheating. Although the usual method of winding adopted for low-pressure machines, *viz.*, compressed stranded cable and multiple strip conductors, is satisfactory up to a certain point, it has disadvantages, particularly that of lack of rigidity.

To overcome the drawbacks of the usual method of winding, a split tubular conductor has been evolved for which a patent has been obtained. This conductor, illustrated in fig. 1, consists of a hard-drawn copper tube split in such a manner that the eddy-current losses are reduced to a minimum. Each half of the tube forms a separate conductor, the two conductors forming two parallel circuits in each phase winding, and being insulated from each other by highly compressed fibre. After this insulation is in position, the two halves of the tube are mica moulded under heavy pressure at a high temperature. Thus the slot bar—consisting of two conductors—is practically solid, and approximates very closely to the ideal mechanical construction for windings.

The illustration shows the two halves with the fibre insulation which separates them, and the two halves fitted together.

In fig. 2, which is a view of the completed stator, the hollow conductors are clearly shown, as well as the end connections, which consist of single copper bars of heavy section held rigidly in clamps. Each slot conductor can be

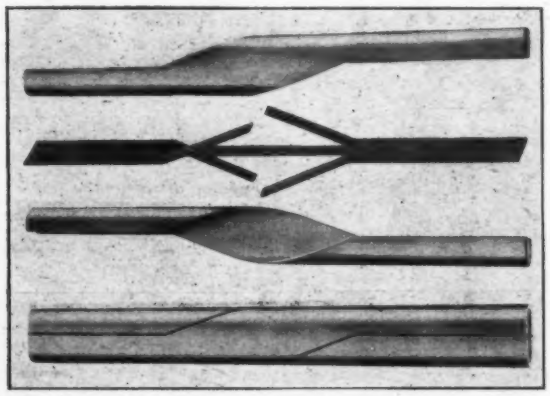

Fig. 1.—Split Tubular Conductor and Components.

disconnected by unsweating the end connector at one end and unbolting at the other, without disturbing any other portion of the winding.

Each bar was tested at a pressure of 5,000 volts before being connected up (525 volts being the working pressure), and in order to ascertain the factor of safety of the insulation, one bar was tested to destruction. This bar finally broke down under a pressure of 30,000 volts.

Extreme care is taken in making the connections between machines and also to the bus-bars, as, with the heavy current involved, there is considerable danger of heating in any iron parts near which the leads pass, due to eddy currents being set up in such parts. Each phase current was divided between two leads, making six leads in all, and these leads were so interspaced that the resulting field was negligible. After erection the connections were tested with a current of 10,000 amperes without any excessive heating either in the leads themselves or in any adjacent portions of the plant.

The following advantages are claimed for this type of low-pressure winding:—

(1) There is no possibility of breakdown between turns in the coils, as there is the equivalent of one conductor per slot.

(2) The insulation, being pressed on a continuous copper surface, is reduced to the minimum quantity, and the clearance required in the slots is practically negligible. This ensures a much better mechanical job than where the copper is

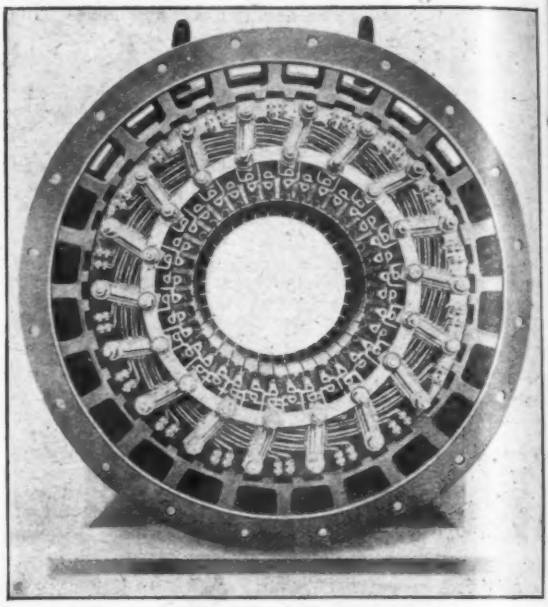

Fig. 2.—Stator wound with Tubular Conductors

separated from the iron of the slot by a cushion of relatively flexible material, which in some cases is at least a quarter of an inch thick.

(3) The end connectors consist of single copper strips of heavy section which can be held quite rigidly in the clamps, and there is no possibility of trouble due to short circuits. When it is remembered that on turbo-generators the stator winding is usually the most vulnerable part of the machine, this point is worthy of consideration.

(4) Each slot conductor and end connector can be disconnected and replaced quite simply, should this be required.

(5) The point of greatest importance is that there is a passage of cooling air through the conductor which gives direct contact cooling over its entire length. To realise what this means the figures given by Mr. G. A. Juhlin in his paper on "Temperature Limits of Large Alternators" (I.E.E. *Journal*, No. 299, page 284), may be quoted:—

	6,600-volt winding.	10,000-volt winding.
(*a*) Temperature of inlet air ...	15 deg. C.	15 deg. C.
(*b*) Temperature rise on surface of laminations in contact with the cooling air ...	40 deg. C.	40 deg. C.
(*c*) Rise in temperature from surface of laminations to surface of slot in contact with the coil	10 deg. C.	10 deg. C.
(*d*) Rise in temperature through insulation on coil	28 deg. C.	48 deg. C.
Actual copper temperature ...	93 deg. C.	113 deg. C.

With the direct-contact cooling obtained with the Brush patented tubular conductor, the temperature rises (*c*) and (*d*) do not occur, as the heat can flow directly to the cooling air. Temperature rise (*b*) which is the sum of the rise in temperature of the cooling air and the rise in temperature on the cooling surface need only be considered, with the result that low copper temperatures can be obtained without any possibility of hot spots. In addition, the internal copper temperature can be definitely measured, as a thermometer can be pushed right into the conductor.

The advantages of this type of winding merit serious consideration for cases where the alternating pressure is suitable. The voltages for which it can be used vary over a fairly wide range and are also dependent upon the output of the alternator.

The London Electricity Supply Problem.

Parliamentary Proceedings.

On Tuesday, May 20th, a Committee of the House of Lords, presided over by Lord Meston, commenced the hearing of a series of Electricity Supply Bills which have an important bearing upon the proceedings just concluded by the Electricity Commissioners. Two of the Bills, known as the London Electricity Supply (No. 1) and (No. 2) Bills, are an essential part of the scheme now being considered by the Commissioners, inasmuch as they are promoted by the two groups of London companies now known as the West End and the East End companies, and contain the agreement with the London County Council and the sliding scale of prices and dividends, the passing of which by Parliament is necessary before the full scheme, which will be issued by the Commissioners and placed before Parliament this session, can operate. The other Bills before the Committee are those promoted by the County of London Electric Supply Co. and the North Metropolitan Electric Power Supply Co., but for the moment the Committee is only considering the London Electricity Supply (No. 2) Bill—promoted by the West End companies, as follows:—The Brompton and Kensington; Charing Cross; Chelsea; London Electric; Metropolitan; Kensington and Knightsbridge; Notting Hill; St. James' and Pall Mall; Westminster; and Central companies.

There is a large number of counsel present in opposition, but, having regard to the proceedings before the Commissioners, their position is uncertain, and on the opening day there was not a great disposition to cross-examine the witness —Mr. Fladgate—for the Bill No. 2.

The Hon. EVAN CHARTERIS, K.C., who appeared for the promoters with Mr. Kennedy and Mr. Wrottesley, gave an account of the legislative development of electricity supply in London from the time of the Electric Lighting Act of 1882 down to the time of the promotion of the Bill by Mr. Merz in 1905 and the subsequent measures of a similar nature, and on to the passing of the Electricity Supply Act of 1919. Throughout all these years, he said, the position created by the early legislation had been one in which if the companies promoted a Bill for the centralisation of supply, the local authorities were bound to oppose it, whilst if the local authorities came forward with any schemes, then the companies were almost certain to oppose, and so any proposal to improve the supply of electricity in London would inevitably be defeated. He related how, arising out of the attempts in 1905 and subsequent years to bring about an improvement, the London Electric Supply Act of 1908 was passed; the object of this was to enable some concerted action to be taken by the London companies operating in the West End, which had come to be known as the West End companies, and comprised 10 out of the 14 companies supplying London. This Act provided for the laying of interconnecting mains between the undertakings of the various companies, and for mutual assistance to be given between them, a thing previously prevented by the Electric Lighting Acts. At the same time, the rights of the various local authorities to purchase the companies' undertakings were transferred to the London County Council. Counsel then gave an account of the events which led to the appointment of the Electricity Commissioners and of the three inquiries which had been held into the London problem, the last of which concluded only last week, and he included in his statement the passing of the Electricity Supply Acts of 1919 and 1922. It was because the ten companies concerned with the present promotion, who had, in 1920, formed the London Electricity Joint Committee (1920), Ltd., saw the impossibility of getting all the local authorities and companies concerned to come to an agreement, that the attempt was made to take a step forward by getting at least the majority of the companies to agree upon a scheme which it was hoped would go some way to carrying out the primary object of the Electricity Supply Act of 1919. It was in this spirit that Mr. Fladgate, the chairman of the new company, suggested a conference of all parties concerned to see if a technical scheme, upon which future development should take place, could be agreed, and that, in fact, was done. (This is the technical scheme scheduled to the draft Order issued by the Commissioners, which was the subject of so much discussion at the recent inquiry on the point whether it could be made compulsory upon the Joint Electricity Authority, when it was established, to carry it out.) Beyond that, said counsel, there had been no agreement. The present Bill, however, constituted the proposals which the ten companies hoped to carry out towards putting this technical scheme into force, and most of the provisions in the Bill had the approval both of the L.C.C. and of the Electricity Commissioners. It was therefore hoped that by 1925 two things would have happened: first, that the draft Order which the Electricity Commissioners were now considering as the result of the inquiry just concluded would have become law, and, secondly, that the proposals of the present Bill would have become operative. The two things in conjunction would mark a stage of capital importance in the progress of electrical development in London.

Coming to the Bill, it was explained that the general principle was that the Joint Electricity Committee (1920), Ltd., should lease the generating stations of the ten companies already referred to, and that the individual companies should remain distributors, the generating company making no profit. It also provided for the extension of the life of the companies from 1931 to 1971, the undertakings at the end of that period to be transferred to the Joint Electricity Authority to be set up by the Electricity Commissioners in the Order which would be issued soon. This modification of the purchase conditions would remove that atmosphere of uncertainty which had hindered the modernisation of the undertakings of the companies in the past. Moreover, the scheme provided that the generation of electricity, so far as it affected the ten companies, should be under one central control, and that would enable obsolete plant to be abandoned and good stations to be improved.

Counsel then went through the clauses of the Bill *seriatim*, after referring to the sliding scale of prices and dividends, which was the subject of much discussion at the recent London inquiry and upon which, it was stated, a complete agreement was hoped to be arrived at with the L.C.C. in the course of a few hours. Therefore, detailed consideration of this was left over for the moment.

By Clause 3 of the Bill, the London Electricity Joint Committee (1920), Ltd., is to be given all the powers of a statutory power company within the areas of the individual companies whose stations it will lease. Clause 9 authorises amalgamations to take place between the various companies. Clause 10 provides for the leasing of the individual power stations of the companies—the leases being scheduled to the Bill. Clause 20 of the Bill relates to the supply of electricity for traction purposes outside the area of the distributing authority, on which there is some opposition, but counsel said that he thought he could offer a clause which would meet the objection. Under Clause 26, provision is made for the sinking fund, of which also a great deal was heard at the recent inquiry; by Clause 29 power is taken to transfer the whole of the undertakings of the ten companies—through the new company—in 1971, to the Joint Electricity Authority to be set up by the Electricity Commissioners. It was thought necessary to put in such a provision for the reason that the Joint Electricity Authority had not yet been established by the Commissioners and that a specific legislative enactment was necessary for the purpose. Under the provisions of the sinking fund, the London Joint Committee (1920), Ltd., would set aside a sum which would represent the assets of the ten companies by 1971, so that the undertakings would then be handed over to the Joint Electricity Authority, to be set up, free of cost in 1971, except for the value of assets created since the Joint Electricity Authority came into existence. It was for this reason that there was provision in the Bill that no expenditure over the sum of £5,000 should be incurred by the new company without the consent of the Joint Electricity Authority, because all such expenditure would represent assets which the Joint Authority would have to pay for in 1971.

At this point Mr. TYLDESLEY JONES, K.C., for the promoters of No. 1 Bill, suggested that it would be a good plan if both sets of promoters deleted from their Bills any reference to each other, because the framework of the two Bills, he said, was different, and there would be difficulties if all the companies were mentioned in both Bills. It would be best for the promoters to refer only to their own respective companies. (In the Schedule to No. 2 Bill all fourteen companies are mentioned.)

The Hon. EVAN CHARTERIS agreed that that would probably be the best course.

Reference was then made to Clause 35 of the No. 2 Bill, which provides for the appointment of a technical committee to carry out the technical scheme. Both sets of companies agreed upon the desirability of such a course, and the suggestion is that a technical committee of nine members shall be appointed, consisting of a chairman with legal or commercial experience, two representing metropolitan borough councils which are authorised undertakers, one representing authorised undertakers outside the County of London within which the companies supply; two representing the new company; one representing other supply companies in the county; one representing power companies; and one representing the railway companies.

Counsel read a long report by the Minister of Transport on the Bill, in which two important issues were raised. One was that the two Bills, with a little modification, ought to be capable of amalgamation, but it was stated that the Ministry had been convinced of the great difficulty of doing this, and therefore did not press that point. The more important issue was that the Bill No. 2 contained many provisions which could be dealt with in the Order to be issued by the Electricity Commissioners, and that therefore there was duplication. On this point Mr. Charteris reminded the Committee that the promoting company wished to be quite

sure that the objects it had in mind would be carried out if the Bill were passed, and it did not wish that there should be any uncertainty in the position by relying merely on an Order made by the Electricity Commissioners. He recalled the fact that already on one occasion the Commissioners, acting upon the highest advice they could obtain, had taken a certain course which subsequent proceedings had proved to be *ultra vires*, and it was with the object of avoiding that sort of thing that the Bill had been drafted in its present form. The promoters desired to take no risks.

Mr. Tyldesley Jones, for No. 1 Bill, said he took the same view.

Mr. Craig Henderson, K.C., for the London County Council, however, said he supported the view of the Minister of Transport that many of the provisions of the Bill could come out, in that they would be dealt with in the Order to be issued by the Commissioners.

Mr. Charteris then indicated a number of amendments in other clauses suggested in the report from the Minister of Transport, some of which he was willing to agree to, but others not, for the reason already stated. When he came to the opposition to the Bill, he said he was at a loss to understand the position, because it did not seem to him that there was any real opposition; the North Metropolitan Electric Power Supply Co. opposed on the question of competition, but that was a matter of adjustment. The L.C.C. objected to certain things in the Bill because the Joint Electricity Authority had not yet been formed by the Electricity Commissioners, and taking all things into account, counsel said he would leave it to those who appeared, to indicate their positions in their cross-examination of his witnesses. Explanations of the technical scheme and the sliding scale were deferred until the evidence of Sir Alexander Kennedy and Sir William Plender respectively had been given.

Mr. W. F. Fladgate, chairman of the Charing Cross Electricity Supply Co. and the London Electricity Joint Committee (1920), Ltd., said he had every hope that there would be a settlement with the London County Council in a few hours, so that the sliding scale and the agreement as to deferring the period of purchase of the companies could be scheduled to the Bill. The terms of the agreement were that the ten companies should lease their generating stations and necessary trunk mains to the new company at a rent equal to 6 per cent. of the actual cost of the stations and mains, less depreciation at the Inland Revenue rate. The price to be charged the individual companies—which would distribute the current—was to be settled by agreement, but in any case it was not to be higher than the price at which the companies could generate for themselves. As to the finance of the new company, it was estimated that a sum of £300,000 would be required immediately for linking up, a further sum of £250,000 for replacement of plant, and a further £250,000 for working capital, but there would be no difficulty in raising that sum of money. In a matter of three or four years there might be required a super-station, and the cost of that was estimated at £2,000,000, but by then the position of the new company would have been made much more stable by the terms of the agreement, and the money should be raised at a lower rate of interest.

At this point counsel for the No. 1 Bill, and the L.C.C., asked to be allowed to defer their cross-examination in view of the fact that a meeting had been arranged for the following morning between the parties, the result of which might remove all opposition from these quarters.

The Committee adjourned.

On Wednesday, May 21st, Sir Alexander Kennedy, F.R.S., was called to deal with the engineering side of the scheme, as the negotiations with the L.C.C. were still going on, and this made it difficult for the cross-examination of Mr. Fladgate to be proceeded with. Sir Alexander said that the scheme was expected to bring about considerable economies. The present cost of generation of the eight companies north of the Thames, *viz.*, the Brompton, Charing Cross, Chelsea, Kensington, Metropolitan, Notting Hill, St. James', and Westminster Companies was 0.814d. per kWh, the total units sold being 167 millions. The average cost of coal was 25s. per ton. As an instance of the economies to be effected under the present scheme, witness mentioned that the units estimated to be sold by the eight companies in 1925-26 amounted to 196 millions, at an estimated generation cost of 0.495d. per kWh. The capital expenditure for the first stage of operating under the new Bill would be £250,000 in connecting mains and converting and transforming apparatus to bring about the economies referred to, these economies amounting to £261,000 per annum, as compared with the present costs, after allowing for capital charges. In 1931 the estimated units sold were 279 millions, and the cost of generation would be 0.452d., and there would be a gross economy of £418,000, from which the capital charges and the amounts due to compensation would have to be deducted. If the companies continued to work until 1931 under the present conditions without any combination, he estimated that the present figure of 0.814d. per unit would only be reduced to 0.73d.

Lord Banbury said there was no compulsion under the Bill for the companies to amalgamate, and there might be some companies which would not, and therefore there might not be any economy.

Sir Alexander Kennedy replied that the whole scheme was on the basis of all the companies working together, which would result in the lesser use of the inefficient stations and the better use of the more efficient.

Lord Banbury said no doubt it was the hope that this would happen, but it was not definitely provided for in the Bill. He then put many questions on the point that it seemed to him that under the scheme the present management which was efficient was being replaced by three other bodies, *viz.*, the new company, the technical committee, and the Joint Electricity Authority, and confusion might be made worse confounded.

Sir Alexander Kennedy explained that so far as the companies were concerned the generation would be in the hands of the one new company, which would deal with the plants as a whole and generally obtain much better results. The other two bodies would be constituted by the Electricity Commissioners. The board of the new company consisted of the chairmen of the existing companies.

The Chairman asked what would be the additional cost of the new company as regarded management, seeing that the management of the existing companies would be maintained.

Sir Alexander Kennedy said the same staff would not be maintained in cases where the generating stations were either shut down or worked to a smaller extent. Until a large number of the stations had been dealt with, the overhead charges would remain the same. Generally, however, he had no figures to show the increased management charges due to the establishment of the new company, which could be set against the savings in generation.

Sir Lynden Macassey, K.C., opposing for the West Ham Corporation, put it to witness that this scheme was a sort of coping stone for the Electricity Commissioners' scheme, but that nobody yet knew what scheme the Electricity Commissioners would produce. The promoters were therefore asking Parliament to sign a blank cheque.

Sir Alexander Kennedy replied that if the Commissioners were coming before the Committee this question could be put to them.

Sir Lynden Macassey added that once the Order was made by the Electricity Commissioners there was no practicable opportunity for opposition. Another point raised by Sir Lynden Macassey was that the present Bill provided for a technical committee which included also the local authorities in its jurisdiction, and that under Clause 35 the London County Council was to have the right of chairmanship of the Technical Committee. What justification was there for that?

Sir Alexander Kennedy said he had always held the view very strongly that West Ham and all other local authorities and companies should be working together.

Sir Lynden Macassey asked whether, in view of the inter-relationship of local authorities in the Metropolitan area, it was likely to lead to a solution of the difficulty if the L.C.C. were put in a position of chairmanship of a Technical Committee having jurisdiction over such a large area outside the County of London. Moreover, it was tying the hands of the Joint Electricity Authority before it was formed by the Electricity Commissioners, inasmuch as it forced the Joint Electricity Authority to accept this Technical Committee.

Sir Alexander Kennedy replied that the interests were so large that the Joint Electricity Authority could not deal with technical matters, and must have technical assistance.

Questions were then put to show that there was no agreed technical scheme for the whole area, and that the present Bill was endeavouring to force a particular technical scheme upon all the supply authorities in the area.

Witness agreed that there was great opposition to the technical scheme in the draft Order of the Electricity Commissioners, which was essentially the technical scheme proposed by the companies, but that same technical scheme was, he said, largely agreed to at the time it was drawn up in 1921 by a committee which contained a representative of the local authorities.

Sir Lynden Macassey added that the local authorities regarded the technical scheme as taking away from them rights which they now had under the Electricity Acts, and, having regard to what happened at the recent inquiry by the Commissioners, the West Ham Corporation, as the owners of a large undertaking on the outskirts of London, frankly wished to know where it stood as to the technical scheme which was to be adopted. Counsel also referred to the great opposition by the local authorities to the compulsion in the Commissioners' draft Order with regard to the technical scheme, and said the whole thing was made permissive. Now the present Bill was making it compulsory. What was the position to be?

Mr. Charteris, K.C., for the promoters, said the Bill gave effect to such a Technical Committee as the Electricity Commissioners would constitute. The clauses were inserted in the Bill with the approval of the Electricity Commissioners in order that there might be no question of *ultra vires* when the Commissioners made their Order.

The Chairman said it seemed to the Committee that the clauses relating to the appointment of the Technical Committee were not immediately concerned with the principal object of the Bill.

Mr. Charteris agreed that they were not vital to the Bill, but the Electricity Commissioners had accepted the provisions of the Bill subject to the criticisms contained in the Report of the Ministry of Transport.

Mr. Fladgate was then recalled and cross-examined by Mr. Craig Henderson, K.C., for the L.C.C. It was made

clear that it was only on the terms of the agreement—which was discussed at the recent inquiry—that the L.C.C. would consent to the suspension of its purchase powers from 1931 to 1971, when the purchase would take place at the hands of the Joint Electricity Authority. The basis of the agreement was that a Joint Electricity Authority should be appointed for the whole of London and the surrounding area, and a condition precedent to the agreement was that such a Joint Electricity Authority should be established. At the same time, the companies were to be given financial and administrative independence.

Counsel, however, suggested that many of the matters dealt with in the Bill were redundant, having regard to the fact that they could be dealt with by the Commissioners in an Order, such as suspension of purchasing powers, the setting-up of a Joint Authority, and so on.

Mr. FLADGATE said that there was some uncertainty under an Order by the Commissioners, and the companies preferred to have their position made absolutely certain in an Act of Parliament.

Referring to the sliding scale in the agreement, Mr. CRAIG HENDERSON asked Mr. Fladgate if the companies would agree to the few outstanding points being settled by the Commissioners.

Mr. KENNEDY, for the companies, said the companies could not.

Mr. CRAIG HENDERSON said that that introduced a profound difficulty, because he was supporting the companies on certain proposals of the Bill, but now there seemed to be the proposal that the Committee should settle the sliding scale. In that case there would be overlapping between the Committee and the Commissioners.

The CHAIRMAN suggested that the sliding scale should be scheduled to the Bill, and that further discussion should be postponed.

Mr. FLADGATE was cross-examined by Mr. RALPH NEVILLE on behalf of the Aldershot Gas & Water Co., which objected to the powers taken in the Bill giving the new company the right to compete in the Aldershot area for the supply of lighting to railways, such supply being part of that given for railway purposes. Mr. Fladgate refused to give an assurance that the supply would only be given for traction, and the matter will be further discussed on clauses. At the same time Mr. Fladgate offered the North Metropolitan Electric Power Supply Co. the protection asked for by the Aldershot Gas Co., his reason being that the North Metropolitan Co. and the Aldershot Co. were not on the same basis.

Mr. G. W. PARTRIDGE, chief engineer and managing director of the London Electric Supply Corporation, and joint engineer with Sir Alexander Kennedy to the London Electric Joint Committee (1920), Ltd., said that the engineering proposals of the Bill were the best that could be devised, having regard to the conditions under which the ten companies were now working. By this he meant the geographical conditions of the various power stations, which would all come under the control of the new company and be worked by one organisation. There was every prospect, further, of the need for the construction of a new large station. There must of necessity be great economies from such a centralisation of control, both on account of the ease with which inefficient stations could be shut down or used only for peak loads, and also by reason of the fact that when the staffs were under one control they could be much more efficiently utilised and transferred from district to district as occasion demanded. Further, capital costs would be reduced because each station would constitute a standby to others, and, speaking generally, the whole policy would be dictated by a less parochial view than was the case at present. An element which had influenced, not favourably, the extension and development of the London companies, was the uncertainty under the purchase clause of the Electric Light Act of 1888; that was removed by this Bill, which, if passed, would give new life to the companies concerned, and at the same time result in a cheaper supply of electricity for the consumer.

Sir JOHN SNELL, Chief Electricity Commissioner, at the request of the Committee explained the events in the London Electricity Supply problem between the passing of the 1919 Act and the inquiry which had just concluded. He expressed the opinion that the agreement and sliding scale arranged between the London companies and the London County Council was in the best interests of the consumers of electricity in the London and Home Counties area, and, in general principle, said that the Electricity Commissioners fully supported the Bill now before the Committee. With regard to the proposal to appoint a Joint Electricity Authority, Sir John said that there would probably be some amendment in the constitution of this, arising out of the recent inquiry, and in reply to the chairman he said that if anything happened to interfere with the establishment of the Joint Electricity Authority, the machinery of the present Bill could not operate because the powers of the Bill did not take effect until after the "appointed day" which was to be fixed by the Commissioners. At the same time he saw no reason whatever to anticipate that the Joint Electricity Authority would not be appointed, because all parties concerned in the problem, including the local authorities, were agreed that such an authority should be appointed.

Discussing the proposal to appoint a technical committee under the present Bill, Sir John expressed the view that it was not absolutely necessary to have these provisions in the Bill, although they would make the appointment of a technical committee a certainty. There was some difference of opinion with regard to the proposed technical scheme which was, nevertheless, agreed as between the L.C.C., the companies, and the Commissioners. In 1921 this same scheme in general outline was agreed to by the local authorities, but at the recent inquiry certain amendments were asked for on the ground that the Commissioners were going beyond their powers in making the technical scheme compulsory, and for that reason the whole thing had been made permissive. As to the technical committee, the Commissioners were advised that they had powers to appoint this under Section 8 of the Electricity Supply Act of 1919, which conferred the power to give general directions to the Joint Electricity Authority when established, and it was the intention of the Commissioners to give directions to the Joint Authority to appoint a technical committee.

Dealing with the sliding scale of prices and dividends, Sir John said that the Commissioners had approved of this in general principle, although there were a few details yet to be determined. The Commissioners had come deliberately to the opinion, with the L.C.C., that this sliding scale was essential in the interests of consumers of electricity, and so far as could be foreseen the agreement was a better solution for the consumer than the purchase by the L.C.C. of the companies in 1931.

In the course of some questions by Mr. TYLDESLEY JONES, K.C., for No. 1 Bill, it was made clear that the view held by the advisers of these promoters was that the Commissioners had not power under the Electricity Supply Act of 1919 to set up a technical committee compulsorily, and the view of the promoters of both Nos. 1 and 2 Bills was that in order to avoid any possibility of litigation the compulsory setting-up of a technical committee should be provided for in these two Bills.

Sir JOHN SNELL admitted that regard must be had for this legal view. Sir John also agreed that the establishment of a Joint Authority was dependent upon the passing of Nos. 1 and 2 Bills.

Sir WILLIAM PLENDER was then called on behalf of the promoters, and explained the general scheme of the sliding scale as it had already been dealt with before the recent inquiry.

At the close of the day it was announced that only a few points of minute detail remained to be settled between the L.C.C. and the companies, and that these were to be submitted to the Electricity Commissioners for settlement in the evening.

Electrical Enterprise in Manchuria.

IN the course of an article on the "Electrical Industry in China," which appeared in these pages on January 11th, 1924, brief reference was made to the electricity undertakings of Manchuria.

The South Manchuria Railway (which was, of course, mentioned in that report) is a Japanese concern. Its board of directors is considered to include some of the most far-sighted and go-ahead men in Eastern Asia. Few railways in the world have more varied interests, or a broader based policy, or a more intimate connection with the industrial well-being of their country. It includes among its manifold activities numerous electrical undertakings.

The company's electricity department is under the directorship of Mr. T. Idzuhara, and controls most of the electric light and power stations in the company's extensive territory, including plants at Dairen, Mukden, Changchun, Antung, Port Arthur, Newchang, and numerous other places. The total capital value is about £1,000,000.

The largest station is the Hamacho power station at Dairen, originally erected by the Russians near the railway shops and harbour. When taken over by the S.M.R. from the Japanese Government it was a very poorly-equipped installation. Light and power were first supplied in October, 1907. There are three power stations in Dairen altogether, and, in addition to these, there is another at Shakako, a few miles out of the city, for the service of the large railway shops in that locality. The equipment here is entirely British, including Babcock and Wilcox boilers, superheaters, and stokers; Weir feed pumps; Belliss & Morcom engines; and Dick Kerr generators. Similar plant of British make is also installed at many of the other stations. Japanese equipment has been supplied by the Yasukawa Electric Co., the Shibaura Engineering Works, the Mitsubishi Co., of Kobe, and others.

There is a large station at Mukden, first installed in 1908; and another at Changchun, originally equipped with plant taken from the old Russian installation at Dairen. This commenced service in February, 1910. The S.M.R. took over the works of the Antung Electricity Co. in 1911, and at once commenced the erection of a new power house. The electric plant at Port Arthur is owned by the Kwantung Government, but is under the management of the S.M.R. electricity department. The Newchang plant is operated by a private

company, the Yinkou Waterworks and Electricity Co., organised under Japanese laws, but its shares are largely owned by the S.M.R., and its works supervised by that company.

Hydro-electric schemes.—The S.M.R. is at present interested in a rather promising hydro-electric project near Igen, on the Yalu River, in Korea, about 100 miles above Antung. At this point in the river there are numerous rapids which, it is estimated, should give 35,000 h.p. in summer and at least 10,000 h.p. in winter. It is understood that no dams are required for the scheme, whilst the necessary material for tunnels and canals is obtainable near at hand. Five miles below this site there is another series of rapids with a possible 20,000 h.p. The Government of Korea some time ago established a special Water Powers Development Department, and it has been recently estimated that the total available water power of the peninsula is at least 1,000,000 h.p., of which the Yalu basin could contribute 700,000 h.p.

The distance of Antung from the Igen site, as stated, is at least 100 miles, and therefore there would be high transmission costs. Mukden is about 160 miles away. Since, however, the maximum distance to which power may be economically transmitted is estimated at 200 miles, both these important points could be supplied from the Igen station if there is sufficient demand. At present only about 2,000 kW is consumed at Antung, but certain mines and industries, at present closed or running much below capacity, might open up again if sufficiently cheap power were available. It is true that some of the most desirable power sites are on the Chinese side of the Yalu, and all transmission lines into Manchuria will have to cross Chinese territory; but, on the other hand, a start could be made with stations on the Japanese side, to supply, in particular, the rapidly-growing industrial city of Ping-yang.

Most of the stations in South Manchuria are operated by steam, using coal supplied by the Fushun mines, which some authorities seem to regard as practically inexhaustible, whilst others are of opinion that the supplies will give out in another century. In any case, there is every reason why water powers should be developed to the utmost in order to conserve the coal supplies, for even if theoretically inexhaustible, the cost of winning the coal must constantly increase.

The S.M.R. has shown considerable enterprise in connection with these Fushun mines, having adopted the newest plant and the most modern methods. There are three electric power houses here, two of which are equipped with several Mond gas plants and by-product recovery plants, *e.g.*, for tar and ammonium sulphate. The third plant is noteworthy as being the first in China to be equipped with a pulverised coal installation. It is of the Holbeck type, with three Bonot's pulverisers of a total capacity of five tons per hour, the coal being reduced to a fineness of 1/100 in. These power houses not only supply all the light and power required for the mines, but also work an electric railway for conveying the coal to the S.M.R. main-line station at Mukden. Power is also supplied to Mukden and Liaoyang for lighting, and will be largely increased this year.

Parliamentary.

[By Our Special Parliamentary Reporter.]

Central London and Metropolitan District Companies Bill.—On the motion for the third reading of this Bill, on May 22nd, Mr. H. MORRISON moved its rejection. He criticised the provisions relating to tunnelling on the ground that they failed to recognise municipal rights, and asked whether the electricity to be utilised would be taken from the Lots Road station, or whether the companies would generate electricity themselves. He thought an assurance should be given that the electricity would be drawn from the statutory suppliers of electricity, authorised by Act of Parliament.

Mr. HANNON said he was authorised to state that the works contemplated in the Bill would be started with as little delay as possible.

The Bill was read the third time, no definite reply being given to Mr. Morrison.

Electricity and Unemployment.—On May 22nd, during a debate on unemployment, Mr. T. SHAW, Minister of Labour, said the Government was going thoroughly into the question of the electrification of the whole country. The Electricity Commissioners during the last three years had done magnificent work, and the extent of the increase in electrical provision had been very marked. But the Government would not shirk any attempt properly to deal with the electrical problem if it were satisfied that it could do it with advantage to the country and help the unemployed. It had sent engineers to investigate the Severn barrage scheme, and if their reports were favourable, a Government would for the first time really try to solve one of the problems of the future by utilising the tides. Speaking of the development of electricity, he said that since 1919 generating plant had been increased by 60 per cent., the energy generated by 24 per cent., and the capital by 43 per cent. But the Government was not satisfied that electricity had been thoroughly used yet, and it intended to make the most thorough investigation of the subject, and to take any steps that might be necessary after experiments had been made.

Dr. MACNAMARA complained that no electrical power scheme had yet been touched, and yet plans were ready three years ago.

Miss BONDFIELD, Parliamentary Secretary to the Ministry of Labour, said that one of the greatest obstacles in the way of electrical development was that the country would not use even the facilities that now existed. It was most vital and important that the use of electrical power should be popularised. The investigations of the Commissioners showed that there was great scope for the further development and use of electricity. Such development included a considerable expansion of railway electrification and the possibility of supplying collieries, textile mills, and other industries. But electrical development in this country was by no means keeping pace with electrical development in other countries. It was not a party question, but a matter of vital concern to the efficiency and development of our industries as a whole. It was not sufficient to continue to develop electrical plant; it was necessary to find more and more users of the plant. Speaking from the point of view of the domestic use of electricity, she could not conceive of any development that was going to do more for the life and health of our people than the electrification of the country.

Mr. HANNON, a Unionist member, asked what the Government had done towards the electrification of railways.

Mr. SHAW replied that negotiations were proceeding with the railway companies, and with regard to the Southern Railway it was estimated that £5,500,000 would be spent on electrification—£2,500,000 this year. The Government would endeavour to get railway electrification accomplished.

Pacific Cable Board Bill.—On May 19th this Bill was read the third time in the House of Commons.

Commercial Radio International Committee.—On May 19th, Mr. BAKER asked what wireless licences had been granted by Great Britain to members of the international wireless combine known as the Commercial Radio International Committee.

Mr. HARTSHORN, the Postmaster-General, replied that no formal licence had been granted by Great Britain to any member of the Commercial Radio International Committee, but provisional permits had been given to the Marconi Company for communication with Austria, France, Spain, Switzerland, Canada, and the United States.

Replying to a further question by Mr. BAKER, Mr. HARTSHORN said that the companies forming the so-called Commercial Radio International Committee were the Marconi Company, the Radio Corporation of America, the Compagnie Générale de T.S.F. of France, and the Gesellschaft für Drahtlose Telegraphie of Germany. Precise information was not available as to the number of companies in which each of the combine companies had an interest, but it was understood that the numbers were roughly as follows:—The Marconi Company, about 20; the Radio Corporation, about 9; the French Company, about 12; and the German Company, about 15.

London Electrical Undertakings.—On May 20th, Mr. P. HARRIS asked the Minister of Transport, in respect of each of the electrical undertakings purchasable in 1931 by the London County Council, if and when since 1918 any increase was made in their power to charge; what the amount of such charges was before and after the increases; and if any application had been made for revision of such charges.

Mr. GOSLING said that the only electricity undertaking of the nature referred to in which an increase in the maximum price chargeable by the undertakers had been authorised was that under the City of London Electric Lighting Order, 1899. The maximum prices originally authorised by that Order were as follows:—(*a*) For general supply, 5d. per kWh up to a prescribed quantity and 4d. per kWh for all further energy; (*b*) For motive power, 3d. per kWh up to a prescribed quantity and 2d. per kWh for all further energy. Increased maximum prices were authorised in October, 1918, in September, 1919, and in September, 1920, the last, which were still in force, being a maximum of 8d. per kWh for all purposes, with minimum quarterly charges of 10s. in respect of the March and December quarters and 6s. 8d. for the June and September quarters. Applications had recently been made to the Minister by the Corporation of the City of London and by consumers through the London Chamber of Commerce for a reduction of the present maximum prices. These applications were under consideration.

Stonehaven Radio Station.—On May 20th, Mr. BAKER asked the Postmaster-General whether negotiations for the sale of Stonehaven radio station to the Great Northern Telegraph Company were taking place or were contemplated, and whether he was aware that the Great Northern Telegraph Company was a foreign company.

Mr. HARTSHORN said that some informal conversations had taken place on this subject. The company in question was a Danish Company, and it was considering the question of using radio-telegraphy as an adjunct to its cables. It was aware that a licence in this regard could only be issued to a company registered in this country.

L.C.C. Tramways.—In the House of Lords, on May 21st, on the motion for the second reading of the London County Council (Tramways and Improvements) Bill, Lord DENMAN moved that it be an instruction to the Committee which will consider the Bill to strike out all powers relating to tramway No. 4, which would enable tramcars to run along Waterloo Road where stood the Waterloo Hospital.

Lord MONK BRETTON said that 16 millions of public money had been invested in the L.C.C. tramways, and six millions had been paid by the tramways. It was essential that everything should be done to make the tramways a paying proposition. While he sympathised with the hospital, it was unreasonable to ask that this particular tramway should be struck out of the Bill which had been passed by the House of Commons, and which was promoted by all parties on the L.C.C.

After further debate, Lord DENMAN's motion was carried, and the second reading was agreed to.

South American Wireless Consortium.—On May 21st, Mr. HARTSHORN informed Mr. BAKER that the foreign companies associated with the Marconi Co. in the South American Wireless Consortium were the Radio Corporation of America, the Compagnie Générale de T.S.F., and the Gesellschaft für Drahtlose Telegraphie.

Electricity Special Orders.—On May 22nd, in the House of Lords, Lord SALISBURY suggested that, before they were approved by Parliament, Special Orders made by the Electricity Commissioners under the Electricity (Supply) Acts, 1882 to 1922, and confirmed by the Minister of Transport under the Electricity Supply Act of 1919, should all go in the first instance before the chairmen of the House of Lords committees and the chairmen of the House of Commons committees, and on their decision it should rest whether these Orders should be submitted forthwith to either House of Parliament, or should be examined by a Private Bill Committee in the usual way.

Lord BESSBOROUGH supported the suggestion, pointing out that before the Act of 1919 these matters had to come before Parliament in the form of private Bills, and then the question had to be thrashed out in committee. Under the procedure which governed these Special Orders the Electricity Commissioners were empowered to set up huge electricity districts, to appoint joint electricity authorities for them, to give these authorities financial powers involving millions of pounds, and, in fact, to empower them to set up completely new organisations for the development of electricity in large areas comprising several counties.

Lord PARMOOR, on behalf of the Government, informed Lord Salisbury that the Government would support him if he would table a motion to the effect that a Select Committee should be appointed to consider the important matters of procedure to which he had called attention.

Lord DONOUGHMORE, chairman of the House of Lords Committee, and Lord BEAUCHAMP supported this suggestion.

Lord SALISBURY said he would place on the Order Paper forthwith a motion for the appointment of a Select Committee.

Special Orders were then approved in respect of Andover, Maesteg, Cockington (Devon), and Hitchin.

Rotherham Corporation Bill.—This Bill recently came before a House of Commons Committee. It contains clauses dealing with trolley vehicles. These give the Minister of Transport power to authorise routes, and provide for the adaptation of roads for this purpose if necessary, the road authority being liable in certain cases to contribute to the cost. The Minister can only make a Provisional Order in the event of a local authority's refusing its consent to the use of a road for trolley vehicles, and the work must not be carried out until the Order is confirmed by Act of Parliament. There was no opposition to this part of the Bill; on the contrary it was supported by some local authorities. The chairman would not permit the amendment of a clause to dispense with Parliamentary approval of routes where no objection was raised. The clause was amended to give the right of protest to parties other than local authorities.

Ashton-under-Lyne Corporation Bill.—Provisions in this Bill with regard to trolley vehicles, and the extension of the Corporation's electricity supply area, were approved by a Committee of the House of Commons last week.

The Bill enables the Corporation to run trolley vehicles along routes on which the Corporation is now authorised to construct tramways. There is a clause applying provisions of the Tramways Act of 1870 to trolley vehicles, and others providing for the removal of tram rails, and for the approval of trolley vehicles and equipment by the Minister of Transport. It also provides for the authorisation by the Minister of Transport of new trolley vehicle routes by Provisional Order, but in the case of roads outside the borough, a Provisional Order may not be made except with the consent of the local authority and the road authority of the district concerned. A clause was inserted for the protection of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board. It provided that the Corporation should not, without the consent of the Board, make an application to the Minister of Transport for a Provisional Order authorising the use of trolley vehicles or omnibuses on roads within the boroughs of Stalybridge, Hyde, Mossley and Dukinfield, or the urban district of Saddleworth.

The London and North-Eastern Railway Co. and the London, Midland and Scottish Railway Co. petitioned with regard to the carriage of goods and parcels on trolley vehicles, and the Committee decided that the weight of the parcels to be carried should not exceed 56 lb.

With regard to the electricity undertaking, the area of supply of the Corporation was extended to include the urban district of Hurst and the rural district of Limehurst. It was agreed that the price charged for electricity in the added areas should be the same as that charged in the borough.

Yorkshire Electric Power Bill.—The Standing Orders Committee of the House of Lords, on May 22nd, considered an application by the Yorkshire Electric Power Co. to dispense with Standing Orders in connection with the promotion of the above Bill. The Standing Orders had not been complied with, in that notices of the intended application to Parliament were not published, and printed copies of the Bill were not deposited in the appropriate public departments by the dates on which they should have been published and deposited for the present session of Parliament.

Mr. C. E. C. BROWNE said that the promotion of the Bill was the outcome of the Electricity (Supply) Act, 1919, and was supplementary to an Order to be made by the Electricity Commissioners in respect of the West Riding (Aire and Calder) Electricity District, which included a large proportion of the company's area of supply. The Electricity Commissioners, he said, had held an inquiry in May, 1921, into the proposed electricity district, and, as a result, had published their conclusions approving the formation of a Joint Electricity Authority for the district. The machinery under the 1919 Act, said Mr. Browne, was rather cumbrous; the time taken to get these schemes through was considerable, and nothing effective had yet been done. At the same time, he assured the Committee that there had been no undue delay. It was proposed to form part of the district into a "reserved area," in which the company should cease to operate, and to provide for the company's powers in respect of the remainder of its area of supply being enlarged so as to enable it to supply electricity for all purposes. The Order could not be made in its present form without the consent of the company being obtained to its exclusion from a part of its area of supply, and the company was unable to give such consent until the powers which could only be granted by Parliament were obtained. The promoters were authorised by the Electricity Commissioners to state that they earnestly desired that the Bill might be allowed to proceed in the present session of Parliament, because, if the promotion of the Bill had to be delayed until next session, the coming into force of the Commissioners' Order would have to be delayed for a year. It was apparent that the company could not have deposited the Bill or published its notices last autumn (as required by Standing Orders), for it was not until after the inquiry last February that it was agreed that the obtaining of statutory powers for various purposes was an essential supplement to the Commissioners' Order. If the Bill were allowed to proceed, there would be ample time for any persons desiring to object to the Bill to put forward their objections.

There were petitions in favour of dispensing with the Standing Orders by the Corporations of Leeds and Bradford. The Corporations of Sheffield, Rotherham, and Todmorden opposed. Those objecting to the Standing Orders being dispensed with pointed out that the Bill sought materially to alter the existing rights and powers of the Power Co., and that the proposals in the Bill were so controversial that they were not a proper subject for a late Bill. It was also suggested that there was no serious urgency in the matter. The Committee decided that Standing Orders should be dispensed with.

The Southern Railway Bill.—This Bill, which was considered by a Committee of the House of Commons, presided over by Sir JOSEPH HOOD, last week, contains provisions for the transfer of the undertaking of the Wimbledon and Sutton Railway Co., to the Southern Railway Co. The shares issued by the Wimbledon Co. are to be cancelled, and the capital powers transferred to the Southern Railway Co. Provision is also made for the abandonment of some of the works authorised in the Wimbledon Co.'s Acts, but the main part of the scheme for the construction of the railway from Wimbledon to Sutton remains. If those parts of the work which are not abandoned by the present Bill are not opened on the various dates mentioned in the Wimbledon Co.'s Acts, the Southern Railway Co. is to be liable to a penalty of £50 a day until they are opened, or until the sum of the penalty amounts to 5 per cent. of the estimated cost of the works in respect of which such penalty has been incurred. The Southern Railway Co. is not to be liable if the Minister of Transport considers that delay is due to circumstances beyond its control.

German Porcelain.—The Syndicate of German Electrotechnical Porcelain Works reports a recent increase in the costs of production, particularly owing to advances in wages, thus causing higher selling prices. The development of the industry is dependent upon the availability of sufficient working capital and the grant of credits.

Russian Industrial Notes.

The Russian Market.—The opening of the season for building operations is reported to have been accompanied by a revival in the receipt of orders for new stations, underground cables, motors of medium size, and plant for installations of from 100 to 300 kW. The activity in this direction is particularly noticeable in the South. On the other hand the lamp branch is quiet.

Belgian Interests.—The chairman of the Société d'Eclairage de Saint-Petersbourg is reported to have stated at the recent meeting held in Brussels, that despite every effort it had been impossible to get passports so as to permit representatives of the company to visit Russia to make an inspection of the properties. All the company's works are said to be in operation, with an output corresponding to 50 to 60 per cent. of that in pre-war times, the works being embodied in a Soviet trust.

The Meter Branch.—With the object of strengthening the production of electricity meters, the Industrial Commission has put forward a demand that the imports of meters should be restricted. At present the production of meters at the Geissler Works is claimed to satisfy the current requirements of the country. Meters made by this Petrograd works have been tested and approved by the Testing Institution, and some 25,000 meters are included in the constructional programme.

The Central Electrical Trust.—A statement has been made concerning the development of the activity of the Central Electrical Trust during the past two years. It appears that in this period 17 regional constructional departments have been established, which cover the whole of the republic, and are connected with the whole industry, and with all the municipal undertakings. Private retailers have been eliminated and the organisation of the trust is claimed to be as complete as had been reckoned at the time by the Russian A.E.G., whose works are in the hands of the trust. Concerning the output of the trust, it is mentioned that the average monthly production in the six months ended with March, 1924, was greater by 72 per cent. than the average in 1922, but lower by 29 per cent. than the average in 1914. The number of workmen on April 1st, 1924, was 7,500 as compared with 6,000 employed in the same works down to the time of the war. That this increase is not due merely to additions to the staff is shown by the circumstance that while the value of the average production per workman in 1922 equalled 147 roubles per month, the monthly average in the present year is 176 roubles. In taking this matter into consideration it is necessary to make allowances for the period of organisation, the introduction of new manufactures, the small load on the works, and the depreciation of the machinery and plant. Besides the work of actual production the trust has had to undertake considerable work of repairs and also actual restoration. For instance, it has been necessary to reconstruct the testing station, fully re-equip the lamp works in Moscow, where new automatic machines from America have been installed, completely restore the insulator works and erect low- and high-pressure laboratories. In the matter of machinery, the construction of large transformers and turbo-generators has been undertaken, while the cable factory is turning out high voltage underground cables, and flexible cords and wire for telephone exchanges, which were formerly not produced in Russia. In addition, laboratory work is proceeding in the matter of the manufacture of cable dielectrics, wolfram filaments, &c. The lamp factory is declared to be producing lamps of a quality equal to that of other European countries, and the output has been begun of high-pressure porcelain, which has not previously been made in the country. Besides the constructional departments already mentioned, the trust has 25 retail warehouses established in the large towns for the expansion of the trade. In conclusion, it is stated that whereas the average monthly turnover was only 120,000 roubles in 1922, it rose to 825,000 roubles in 1923 and has further advanced to 1,500,000 roubles per month in the six months ended with March. The orders then on hand represented 10,000,000 roubles.

Russian Electrical Bank.—A special committee of the State Planning Commission, with the participation of representatives of the National Commissariat of Finance and the State Bank, has had under discussion the question of the establishment of a special bank for the financing of local electrical construction and of the electrical industry. As a result of the discussion the conclusion has been reached that there is no necessity at the present time for the constitution of such a bank, but that the organisations which now exist for undertaking such financial work should be amalgamated for the purpose of concentrating the capital available and extending the sphere of activity.

Electric Cooking at Sea.—Designed for service in the Far East, the motor-ship *Marudu* has been launched by Messrs. Workman, Clark & Co. at Belfast. Features of the equipment are the up-to-date electrical cooking devices.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1922.

33,052. "Joints for electric cables." Pirelli & Co. and L. Emanueli. December 4th, 1922. (215,036.)

33,468. "Method of operating the cores of reciprocating electrical tools and the like." Central Electric Tool Co. January 4th, 1922. (191,369.)

1923.

2,185. "Electrical phase and frequency converters." B. Nordfeldt and Allmanna Svenska Elektriska Aktiebolaget. January 24th, 1923. (215,052.)

2,250. "Inductance coils." H. Ingham. January 25th, 1923. (Cognate application, 15,464/23.) (215,053.)

2,396. "Electric switches." A. C. Smith. January 26th, 1923. (215,054.)

2,541. "Electric heaters for cooking apparatus." H. Hunt and E. L. Mason. January 27th, 1923. (215,061.)

2,547. "Method of increasing the electric conductivity of alloys." Metallbank und Metallurgische Ges. Akt. Ges. January 27th, 1922. (192,414.)

2,762. "Carrier-current signalling systems." Western Electric Co., Ltd. February 4th, 1922. (192,697.)

2,797. "Apparatus for collecting or transmitting sound." F. Clutsom. January 30th, 1923. (215,071.)

2,910. "Flywheel dynamo-electric machines for internal-combustion engines." R. L. Aspden. January 31st, 1923. (215,075.)

3,045. "Rotary mercury electric switches." Soc. C. Ropiquet, H. Hazart, and H. Roycourt. February 3rd, 1922. (192,704.)

3,147. "Horn or amplifier for sound-recording and sound-reproducing apparatus." G. Lakhovsky. July 6th, 1922. (200,476.)

3,206. "Filament rheostats and other devices having moulded bases." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). February 2nd, 1923. (215,096.)

3,264. "Train-lighting and similar dynamos." J. Stone & Co., Ltd., Sir J. T. Prestige, and A. H. Darker. February 3rd, 1923. (Addition to 199,481.) (215,099.)

3,267. "Devices for connecting and disconnecting electric circuits." A. E. White (Osterreichische Dynamo-Werke Akt. Ges.). February 3rd, 1923. (215,100.)

3,293. "Electric switches." English Electric Co., Ltd., and R. A. E. Bolton. February 3rd, 1923. (215,102.)

3,416. "Means for reproducing sound." H. J. Round. February 5th, 1923. (215,104.)

3,417. "Thermionic valve circuits." H. J. Round and P. W. Willans. February 5th, 1923. (215,105.)

3,464. "Automatic and semi-automatic telephone switching systems." W. Aitken. February 6th, 1923. (215,109.)

3,550. "Storage batteries." Gamewell Fire Alarm Telegraph Co. April 15th, 1922. (196,247.)

3,617. "Fusible cut-outs for electric circuits." J. Schull. February 7th, 1923. (215,116.)

3,841. "Control of wireless receiving apparatus." C. F. Elwell, Ltd., and K. Wilson. February 8th, 1923. (215,121.)

4,545. "Means for introducing capacity effects in alternating electric current systems and apparatus." T. F. Wall. February 16th, 1923. (215,129.)

5,466. "Control or regulation of voltage or electric current in electrical systems." British Lighting and Ignition Co., Ltd., and E. O. Turner. February 24th, 1923. (Cognate application, 17,781/23.) (215,139.)

5,491. "Miners' safety lamps." W. Best. February 26th, 1923. (Cognate application, 12,109/23.) (215,140.)

6,866. "Insulators for use on electric railways and the like having overhead conductor wires." Sir P. Dawson and F. N. Fawdry. March 9th, 1923. (215,147.)

7,413. "Wireless aerials." E. W. Haynes. March 14th, 1923. (215,151.)

8,001. "Induction motors." British Thomson-Houston Co., Ltd. (Compagnie Française Thomson-Houston). March 20th, 1923. (215,158.)

8,830. "Electric relays." Westinghouse Brake and Saxby Signal Co., Ltd. November 29th, 1922. (207,774.)

8,997. "Signalling systems." Western Electric Co., Ltd. (Western Electric Co.). March 29th, 1923. (215,164.)

9,127. "Means for driving phonographs electrically." L. Rosengart. April 3rd, 1923. (215,165.)

9,783. "Electrical condensers of variable capacity." Burndept, Ltd., and C. F. Phillips. April 10th, 1923. (215,170.)

11,200. "Construction of transformer for wireless receiving sets." A. Preen. April 25th, 1923. (215,186.)

13,447. "Shoe for lifts or elevators." R. E. Jackman. May 22nd, 1923. (215,198.)

13,555. "Installations for illuminating and indicating the landing places in aerodromes." Naamlooze Vennootschap Machinerieenen Apparaten Fabrieken. January 23rd, 1923. (210,386.)

13,685. "Dynamo-electric machines." E. C. R. Marks (Ideal Electric and Manufacturing Co.). May 23rd, 1923. (215,200.)

14,028. "Electrically-operated oil cups." R. R. McClure. May 28th, 1923. (215,205.)

15,126. "Driving arrangements for electric motors." G. Jones. June 9th, 1923. (215,213.)

15,941. "Means for making tests or measurements in connection with electrical apparatus and circuits." H. A. H. Nijland. June 20th, 1923. (215,214.)

16,191. "Method of or means for signalling by oscillations of audible frequency." Submarine Signal Corporation. November 11th, 1922. (206,813.)

17,137. "Dual ignition apparatus for internal-combustion engines." J. Courtier. July 2nd, 1923. (215,221.)

22,372. "Arrangements of apparatus for protecting rectifier installations from damage on the occurrence of internal short-circuits." Akt. Ges. Brown, Boveri et Cie. September 16th, 1922. (204,042.)

22,819. "Switching apparatus for telephone exchange systems." F. R. McBerty. October 6th, 1922. (205,062.)

22,889. "Sound box for sound-reproducing instruments." H. Walker. September 12th, 1923. (215,256.)

23,163. "Switches for electric irons." H. Benvie. September 15th, 1923. (215,258.)

25,253. "Ignition device for internal-combustion engines." A. Petrella. October 12th, 1922. (205,492.)

25,852. "Telephonic receiving apparatus." J. Bethenod. October 20th, 1922. (206,139.)

28,831. "Electric motor controllers." W. Fairweather (Singer Manufacturing Co.). November 15th, 1923. (215,274.)

29,175. "Electric furnaces." Metropolitan-Vickers Electrical Co., Ltd. December 2nd, 1922. (207,804.)

29,303. "Electric motor control systems." British Thomson-Houston Co., Ltd. (General Electric Co.). November 20th, 1923. (215,275.)

32,437. "Radio-receiving systems." Marconi's Wireless Telegraph Co., Ltd. December 28th, 1922. (209,102.)

32,635. "Turbine-electric locomotives." H. L. Ingersoll. April 24th, 1923. (Divided application, 196,577.) (209 111.)